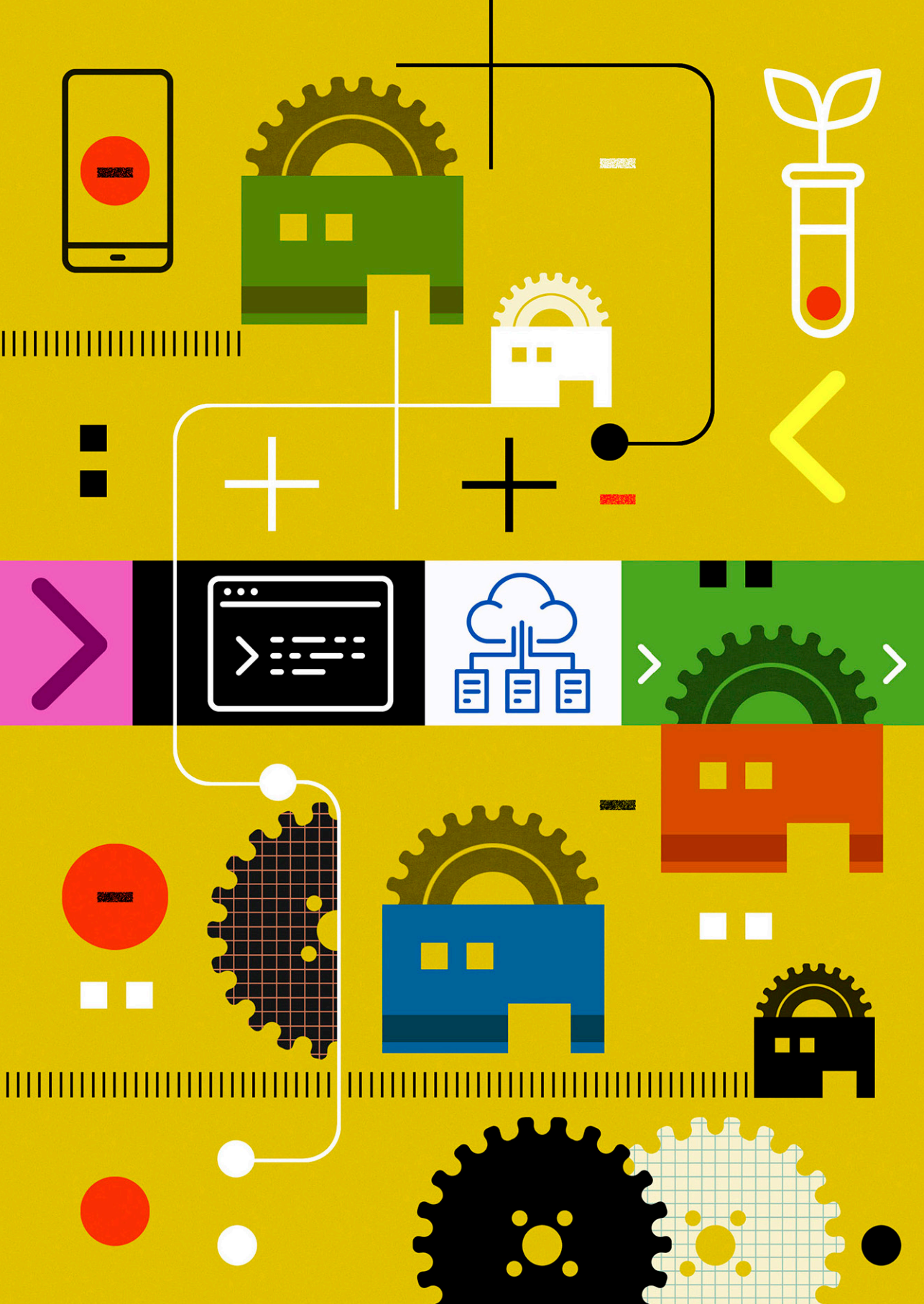

Effects of support from innovation and development agencies: a case study on companies awarded by Tecnova 13/2013 – FAPEMIG

Efeitos do apoio às agências de inovação e desenvolvimento: Um estudo de caso das empresas premiadas pelo Tecnova 13/2013 – FAPEMIG

NARRAYRA GRANIER CUNHA
Mestre em Administração, Pontifícia Universidade Católica de Minas Gerais (PUC Minas). Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG).
Belo Horizonte – MG – Brasil
orcid.org/0000-0001-5449-5705
nagranier@hotmail.com

JOÃO PAULO MOREIRA SILVA
Doutorando, Programa de Pós-Graduação em Administração – Pontifícia Universidade Católica de Minas Gerais (PPGA/PUC Minas).
Belo Horizonte – MG – Brasil
orcid.org/0000-0002-9470-2905
joao.msilva@live.com

LILIANE DE OLIVEIRA GUIMARÃES
Doutora em Administração, Escola de Administração de Empresas da Fundação Getúlio Vargas de São Paulo (EAESP/FGV). Professora, Programa de Pós-Graduação em Administração – Pontifícia Universidade Católica de Minas Gerais (PPGA/PUC Minas).
Belo Horizonte – MG – Brasil
orcid.org/0000-0002-3346-2207
lilianeog@pucminas.br

FERNANDO ANTONIO PRADO GIMENEZ
Doutor pela Manchester Business School - University of Manchester. Professor, Programa de Pós-graduação em Políticas Públicas da Universidade Federal do Paraná, Brasil.
Curitiba – PR – Brasil
orcid.org/0000-0002-5143-9553
fapgimenez@gmail.com

Abstract

Innovation plays an important role for the sustainability of small and medium enterprises - SME, as it enhances their competitive advantage. As one of the elements of government stimulus, the economic subsidy provides access to non-reimbursable financial resources. By means of documentary research, interviews, and direct observation, this study sought to understand the effects of fostering innovation for SMEs awarded by the Tecnova Edict 13/2013, a partnership between FINEP and FAPEMIG. As a result, it was confirmed that government support represents a fundamental instrument for the development of SMEs, offering them opportunities to acquire materials and technologies, train human resources, and facilitate the building of partnerships. The research also identified factors that make it difficult to carry out research and development activities in this segment of organizations. Although hindering elements of the innovation process were highlighted, it was found that government support is fundamental to the promotion of innovation.

Keywords: Innovation. Public policies. Government support. Small and medium-sized enterprises. Economic subsidy

Resumo

Inovação tem um papel importante para a sustentabilidade da pequena e média empresa, na medida em que aprimora sua vantagem competitiva. Como um dos elementos de estímulo governamental, a subvenção econômica proporciona acesso a recursos financeiros não reembolsáveis. Por meio de pesquisa documental, de entrevistas, e observação direta, este estudo buscou compreender os efeitos do fomento à inovação PMEs agraciadas pelo Edital Tecnova 13/2013, uma parceria entre FINEP e FAPEMIG. Como resultados, confirma-se que apoio governamental representa instrumento fundamental de desenvolvimento das PMEs, oferecendo-lhes oportunidades de aquisição de materiais e tecnologias, capacitação de recursos humanos e facilitar construção de parcerias. A pesquisa também identificou fatores dificultadores para a realização da atividade de pesquisa e desenvolvimento nesse segmento de organizações. Embora elementos dificultadores do processo inovativo tenham sido ressaltados, constatou-se que o apoio governamental é fundamental para a promoção da inovação.

Keywords: Inovação. Políticas públicas. Apoio governamental. Pequenas e médias empresas. Subvenção econômica

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INTRODUCTION

The discussions about innovation in the academic sphere, in the governmental arena or in the economic/managerial context are not recent (ACS, 1990). Innovations are considered drivers of development, important tools for building competitive advantage (WIKLUND & SHEPHERD, 2003) and engines for economic development and job creation (ACS, 1990), besides positively impacting social welfare (DIACONU &DUTU, 2015; OLIVEIRA & TELLES, 2011).

Small and medium-sized enterprises (SMEs) are responsible for moving significant economic values in the country, creating jobs, trade and service provision (Brazilian Service of Support to Micro and Small Enterprises - SEBRAE, 2014; 2015). Such companies also deal with an increasing pressure to innovate, especially in times of economic recession, and have fewer resources available to innovate. For SMEs, although qualified human and financial resources are scarce, their proximity to the market and customers, in addition to flexibility and adaptability, allow them to seek innovation opportunities (LERNER, 1999). In this perspective, it is believed that small and medium-sized companies have an environment conducive to innovation and greater ability to interact with other companies, entering into fundamental strategies and partnerships for the transmission of knowledge and experiences that favor the innovation process (WIKLUND & SHEPHERD, 2003; AVELLAR & BOTELHO, 2015).

With the proposal to provide greater access to science, technology and innovation in the business environment and stimulate the development of SMEs, the government has been seen as an important actor in the entrepreneurial ecosystem (ISENBERG, 2011; STAM, 2015; SPIGEL, 2020), implementing public policies focused on investments in R&D in companies (OLIVEIRA & TELLES, 2011). Among the government initiatives to promote scientific research and innovation, we can mention the National Fund for Scientific and Technological Development - FNDCT, the Financier of Studies and Projects - FINEP and, for the consolidation of regional systems, the Research Support Foundations - FAPs of the Federation states. The FAPs represent "important mechanisms of decentralization of support to STI, and structure with the other Institutions of Science and Technology - ICTs, the Brazilian Innovation System" (MATOS & ESTEVES, 2015, p. 3).

In the case of SMEs, the economic subsidy - modality of government support, but still little widespread in the state - is an example of a strategy to enable the acceleration of the innovation process within companies (BORGES, 2011). The Tecnova program, in the state of Minas Gerais, concluded between the development agencies FINEP and the Foundation for Research Support of the State of Minas Gerais - FAPEMIG and implemented in 2013, had the purpose of supporting projects that fit into several business fronts, such as agribusiness, biotechnology, alternative energy, oil and gas, among others, aiming at the development of the state of Minas Gerais (FAPEMIG, 2013).

An important gap in studies on the promotion of innovation is precisely the evaluation of public policies aimed at innovation, especially focusing on small businesses (SILVA; DI SERIO; BEZERRA, 2019). In this context, the study sought to analyze the effects of public agency support for innovation promotion in SMEs, having as object of study the SMEs awarded by the economic subsidy program of FINEP in partnership with FAPEMIG. The results obtained contribute to reinforce the importance of public support to stimulate innovation in small businesses, but, mainly, point out the necessary improvements in public edicts directed to micro and small organizations in order to leverage their competitiveness and their innovative capacity.

The article is subdivided as follows: after this introduction, the theoretical framework is presented, where the discussion about entrepreneurial ecosystem, possibilities of government action in the development of innovations and how these occur in SMEs will be detailed. In section three the methodology used will be presented, followed by the analysis of the results and, finally, in the last section, there is a discussion of them. The final considerations conclude the article in section six.

THEORETICAL FRAMEWORK

For the theoretical foundation of this study, a set of themes was adopted. Initially, at the broadest level, we discuss aspects related to entrepreneurial ecosystems that have been increasingly addressed in recent literature (ROUNDY; BRADSHAW & BROCKMAN, 2018; SPIGEL, 2020). Next, issues associated with public policies are addressed, as they play a relevant role in entrepreneurial ecosystems. The next two sections, respectively, deal with innovation in small businesses and its indicators. Finally, the last section presents the theoretical model developed as a basis for data collection and analysis.

Entrepreneurial Ecosystem

Entrepreneurship and innovation play a key role in economic development, contributing to job creation and prosperity (DIACONU & DUTU, 2015). The creation of new ventures and the development of new products and processes are capable of stimulating competition, increasing efficiency, as well as stimulating learning and disseminating knowledge. The creation and development of new companies is a result of numerous factors and institutions that act, to a lesser or greater extent, as drivers of entrepreneurship (ISENBERG, 2011).

Gnyawali and Fogel (1994), for example, elaborated a five-dimensional framework to explain the process of new venture creation - public policies, financial assistance, non-financial assistance, socioeconomic conditions, and entrepreneurial and business skills. These factors, in the authors' view, once combined, would influence entrepreneurship. The Organization for Economic Cooperation and Development - OECD, also establishes elements that constitute the entrepreneurial ecosystem,

namely: regulatory model; market conditions; access to financing; creation and diffusion of knowledge; entrepreneurial training; and entrepreneurial culture.

Isenberg (2011) also emphasizes the importance of elements that can influence entrepreneurial activity, whose environment was named entrepreneurial ecosystem - EE. The EE is composed of the following domains: public policies; financial capital; culture; support institutions; human resources; and markets. For Isenberg (2011), the Public Policies domain is composed of the Leadership and Government dimensions. The Leadership dimension is composed of five elements such as unequivocal support, social legitimacy, open doors for advocate, entrepreneurial strategy, and urgency, crisis, and challenge. In the case of the Government dimension, the elements are of two orders: government support to promote and stimulate innovation and entrepreneurship and establishment of regulatory legal guidelines that can somehow assist entrepreneurship (ARRUDA et al., 2013; ISENBERG, 2011). In this paper, the Public Policy domain represents an important pillar for understanding the effects resulting from fostering innovation for SMEs.

Public policies (ISENBERG, 2011; GNYAWALI & FOGEL, 1994) or regulatory model (OECD, 2009) indicate the greater or lesser ease of doing business in a given location. Such dynamics will be conditioned by the local government, which fosters the development of the entrepreneurial ecosystem and actively participates in it (ISENBERG, 2011). Also related to government action through public policies is the financial support to companies, which may contribute to the financial management of organizations, such as ease of access to loans and commercial networks (GNYAWALI & FOGEL, 1994; OECD, 2009), loans, investors or capital markets (ISENBERG, 2011).

It is noteworthy, however, that the presence of all domains in a given context or territory is not considered essential for the construction of an EE. However, the existence of the public policies domain, directed to the stimulus of new businesses is still considered an essential factor of development and promotion of innovation and entrepreneurship (FUERLINGER et al., 2015; SPIGEL, 2020).

Public policies and their role in supporting innovation

The public policies domain of the entrepreneurial ecosystem is considered an important element in the promotion of innovation, closely linked to the increase in productivity, competitiveness and economic development of a country (CARVALHO et al., 2016; ISENBERG, 2011). The term public policies is defined by Teixeira (2002, p.2) as "directives, guiding principles for public power action; rules and procedures for relations between public power and society, mediations between society and state actors." The discussion on innovation and public policies directed to its promotion are directly related to entrepreneurship, considering it responsible for operationalizing innovation - introducing the novelty in the market (INÁCIO JUNIOR et al., 2016).

Thus, the government can dedicate itself to the role of facilitating the promotion of entrepreneurship, being an important agent in the economic environment, with

the fundamental objective of promoting and stimulating the economy of a country (CARVALHO et al., 2016; CIRANI et al., 2016). Thus, the main government action to stimulate economic growth will be through public policies that can support entrepreneurship (INÁCIO JUNIOR et al., 2016). Regarding public policies aimed at innovation and support for entrepreneurship, the State acts as a channel for these processes (CIRANI et al., 2016).

In the development and implementation of public policies to promote entrepreneurship and innovation, it is recommended that the government go beyond educational initiatives and integrate actions linked to other public areas, such as the legal and regulatory framework, in addition to creating funding and credit opportunities (FUERLINGER et al., 2015; LERNER, 1999). In this sense, government efforts to promote innovation should be guided by regulatory policies and stimulus policies (SARFATI, 2013). Regulatory policies are those that define basic rules for business entry and exit - tax rules, intellectual property rules, rules that influence business liquidity, labor and social rules, and property rules. The stimulus policies, on the other hand, are actions that influence entrepreneurial activities, such as fostering programs, promotion of entrepreneurial culture, national and regional policies, among others (SARFATI, 2013). It is also considered as policies to stimulate entrepreneurship and innovation promotion and financing programs, tax incentives, and specific allocations of the public budget to promote entrepreneurial and innovative activity (LASTRES et al., 2003). Table 1 presents a summary of government actions to stimulate innovation practices in MSEs.

Table 1 - Main government actions to stimulate innovation in micro and small companies

Regulatory policies to facilitate innovation	Policies to stimulate innovation
Basic rules of entry and exit of business	Incentive programs and funding
Labor and Social Rules	Promoting entrepreneurial culture and innovation
Tax rules	Training, consulting and information programs
Ownership rules	Tax incentives
Intellectual property rules	Financial resources from public budgets earmarked for innovation
Rules that influence liquidity	Assistance in the constitution of local arrangements and networks

Source: prepared by the authors with data extracted from Lastres et al. (2003), Sarfati, (2013), Pacheco and Almeida (2013) and Barboza et al. (2017).

Since the 1990s, Brazil has undergone reforms in its regulatory framework in order to stimulate innovation support programs (MORAIS, 2008; OLIVEIRA & TELLES, 2011; SILVA; DANTAS, 2013).

The path of these policies, however, has its roots in 1951, through the creation of the Financier of Studies and Projects - FINEP and the Ministry of Science and Technology, in 1985 (BRASIL, 1985). This ministry is responsible for innovation policies

in several areas, with FINEP and the National Council for Scientific Development (CNPq) under its jurisdiction (MCTIC, 2018). Specifically to the promotion of innovation, the national regulatory framework encourages efforts and investments in S, T&I, constituting the Sectoral Funds of Science and Technology, the Innovation Law (BRASIL, 2004), and the legislation usually recognized as "Law of Good" (BRASIL2005).

Sectorial Funds are recognized as the main sources of resources for the financing of scientific and technological activities in the country (GUIMARÃES, 2006; SILVA & DANTAS, 2013). Among them, the Fundo Nacional de Desenvolvimento Científico e Tecnológico - FNDCT (National Fund for Scientific and Technological Development) stands out, structured to provide the expansion of non-reimbursable financing (MORAIS, 2008). Government support for R&D in companies can also be seen from the existence of tax incentives for this activity. The Innovation Law, for example, established that the Union should promote innovation in companies by granting tax incentives, through three forms of support: economic subsidies, credit and equity participation in companies (BRASIL, 2004). The economic subsidy model appears as an important alternative of non-reimbursable resources for companies, especially the small ones, presenting itself as a way of sharing costs and risk between the organizations and the State. Resources are, as a rule, released in decentralized ways, through local financial agents (BORGES, 2011; FINEP, 2017; MCTIC, 2016).

Another important instrument for the consolidation of the STI programs are the FAPs (Research Support Foundations). These actors act as a channeling element, to the extent that they enable, from the funding edicts, the formation and dissemination of knowledge, fulfilling an essential role in the innovation process (BORGES, 2011). FAPs act together with FINEP, aiming at the implementation of public programs related to innovation (GUIMARÃES, 2006).

Finally, in 2016, the country began to count on a new initiative to stimulate innovation: the new regulatory framework for science, technology, and innovation (BRASIL, 2016). The new Legal Framework enables better functioning of the EE, insofar as it proposes to facilitate articulations between universities and companies (GIMENEZ; BONACELLI & BAMBINI, 2018), flexibility in the processes of innovation development, debureaucratization of bidding systems, purchase and import of products intended for scientific and technological research, and tax and financial aid (ALMEIDA, 2018; RAUEN, 2016). Table 2 summarizes the national initiatives to encourage research and innovation.

Table 2 - Initiatives to encourage research and innovation

Initiatives	Year	Description
National Development Council Scientific - CNPq Research Area Law in Brazil - Law 130/1951	1951	Its main attribution is to foment scientific and technological research.
Financier of Studies and Projects - FINEP Decree Law No. 61,056/1967	1967	Aims to promote scientific and technological development and innovation through public funding
Program to Support Scientific and Technological Development - PADCT	1984	It aims to strengthen technological development, capacity building, and human resources training.
National Development Fund Scientific and Technological Decree Law No. 719/1969 Law 11.540/2007 Decree No. 6.938/2009	1969 2007 2009	It aims to financially support scientific and technological development programs.
Creation of the Ministry of Science Technology and Innovation - MTCI Decree 91.146/1985 Decree nº5.886/2006	1985 2006	Issues involving policies on innovation, technology, scientific research, control of activities in this area, policies on automation, information technology, biosecurity, space, nuclear, and control of the export of sensitive goods and services.
Science and Technology Sector Funds	From 1990	Main sources of funding for scientific and technological activities in the country.
Innovation Law Law 8.661/1993	1993	Provided tax incentives for training technology in industry and in agriculture and cattle raising. This law was revoked by the Good Law.
Innovation Law	2004	Provides incentives for innovation and scientific and technological research in the productive environment, and makes other provisions.
Good Law Law 11.196/2005	2005	Provides tax incentives to companies that carry out technological innovation research and development.
Research Support Foundations		They act as channeling elements in the scientific and technological development. They operate in partnership with institutions such as CNPq and FINEP.
National Strategy for Science, Technology and Innovation - Encti 2016-2019	2016	Boosting scientific and technological development in order to make Brazil one of the countries with the greatest development in STI
New Legal Framework for Innovation Law 13.243/2016	2016	Incentive to innovation and scientific and technological research.
Ministry of Science, Technology, Innovations and Communications Law 13.341/2016	2016	Expanding the contributions of the agencies (Ministry of Communications and MCTI) in the delivery of relevant public services for the development of the country.
Decree No. 9,283	2018	Establishes incentive measures for innovation and scientific and technological research in the productive environment, aiming at technological qualification, the achievement of technological autonomy, and the development of the national and regional productive system.

Source: elaborated by the authors

With regard to Brazilian programs to encourage innovation in SMEs, it is possible to see a better performance of companies that participate in innovation support programs. Such companies usually exhibit higher indicators in net sales revenue and productivity, higher spending on R&D and innovative activities, higher education of human resources, greater organizational innovation and higher occurrence of patent deposits (AVELLAR & BOTELHO, 2016).

Innovation in small and medium-sized enterprises

SMEs represent one of the pillars of support for the economy, holding great participation in trade, services and industries, in addition to employing a large number of people (ACS, 1990), including in Brazil. It is remarkable the importance of SMEs for economic development, and how necessary it is to encourage innovation in companies (FARIAS et al., 2014; TIDD & BESSANT, 2015). The scarcity of resources for innovation in SMEs leads them to better monitor their market for a more precise definition of their performance. With market monitoring and knowledge, these companies can identify their customers' needs and operate on demand, integrating information from their users. The involvement of customers in the production process, for example, positively affects the innovative performance of companies (WIKLUND & SHEPHERD, 2003).

Another positive point of the innovative process within SMEs is related to the increase in their power of adaptation to the market, precisely because they are more flexible. Related to the flexibility of SMEs, they have a greater ability to interact with other companies of the same size and can enter into strategic alliances with institutions and research centers. The ease of approach with other companies also provides the obtaining of information and knowledge, contributing to the transmission of tacit knowledge, favoring the innovation process (AVELLAR & BOTELHO, 2015).

However, small and medium enterprises face some obstacles in their innovative process, such as the discontinuity of the programs that help those (LASTRES et al., 2003). Although there are public apparatuses to encourage the development of SMEs, there are still problems in macroeconomic policy and the absence of coordinated policies. The inadequacy is noticed in development and financing programs structured to serve large companies, but that seek to frame SMEs, and thus become inefficient for them.

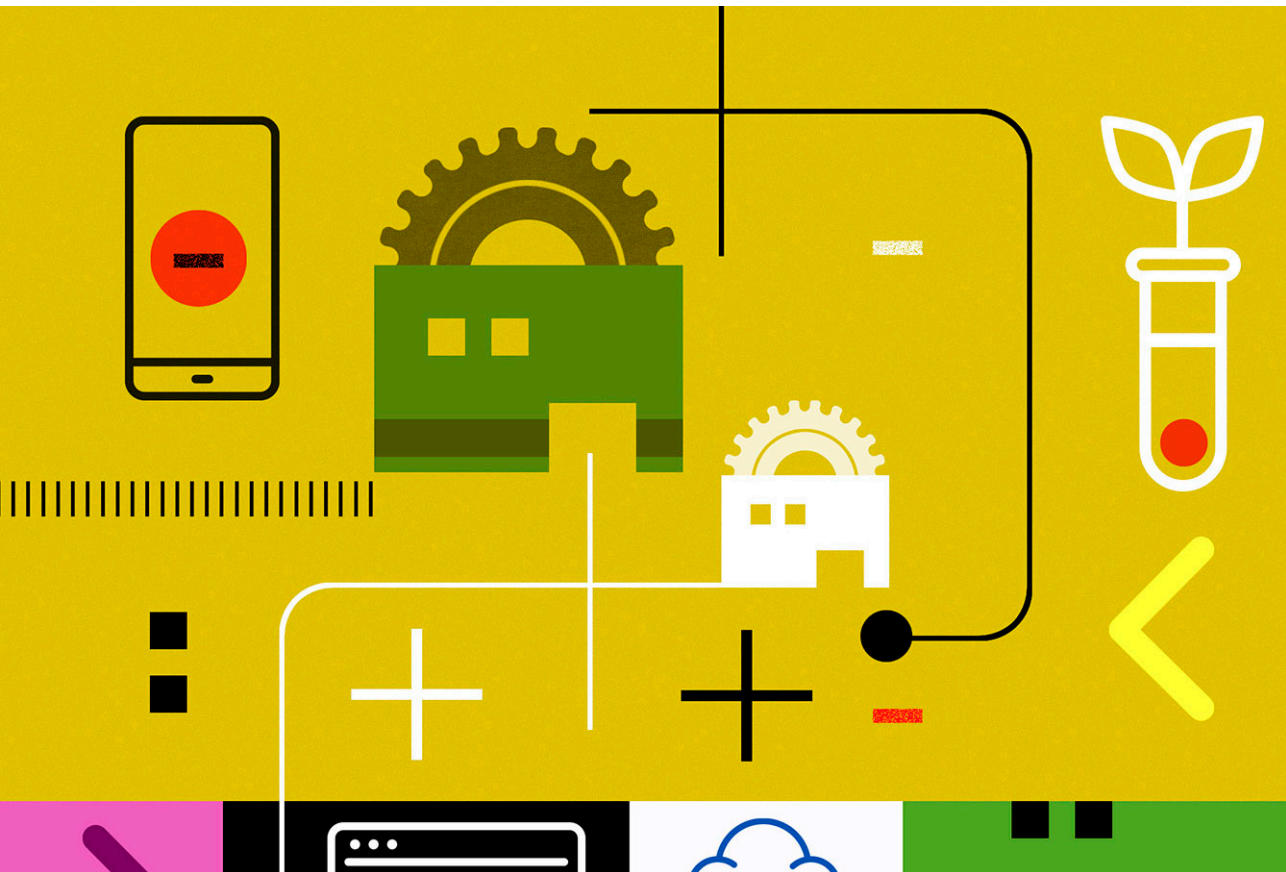
Another complicating element in the innovation process in SMEs is the risk of the activity. Small and medium-sized companies are economically more fragile and suffer greater impact from macroeconomic variations. In addition, the innovation process requires high resources and organizational capabilities, not easily found in these organizations. The absence of skilled labor to assist in the innovation process also represents a problem experienced by SMEs. The attempt to minimize these difficulties can be seen in the valorization of the culture of innovation and in the development of new formats of supporting programs capable of changing the

framework of funding and promotion, for example, with specific solutions for small businesses (LATRES et al., 2003).

Innovation indicators

Innovation incentive programs are, as a rule, measurable from innovation indicators. The evaluation of impacts related to R&D incentive programs can be divided into two groups of indicators: indicators that measure the inputs or efforts used in the innovation process, and indicators that measure the results of innovation (LEAL et al., 2016; RASERA & CHEROBIM, 2012).

As examples of indicators that measure the efforts, scientific activities are cited, such as basic research, applied research, experimental development; technological activities - such as resources allocated to R&D -, existence of partnerships between universities, institutions and other organizations, capital investment in R&D and hiring of technological resources (RASERA & CHEROBIM, 2012). The indicators related to the results of innovation refer to elements such as number of patents, number of finished projects, billing for new products and cost savings from innovation (LEAL et al., 2016; RASERA & CHEROBIM, 2012). The impacts of innovation may be reflected in increased sales, permanence and/or expansion of the market, increased international competitiveness, in the volume of organizational knowledge and its communication networks (OECD, 1997).



Another tool used to measure innovation is the Innovation Audit, an instrument that helps to identify how the company deals with innovation (TIDD & BESSANT, 2015). The tool corresponds to a questionnaire consisting of 40 items, subdivided into five dimensions: strategy, learning, relationships, processes and innovative organization. The results achieved by the companies are represented in simple average for each of the dimensions, whose answers may vary on a scale from 1 to 7. Table 3 presents the definitions of each of the categories addressed in the Innovation Audit.

Table 3 - Dimensions of Innovation Auditing

Dimension	Description
Strategy	It refers to which strategy the company has adopted, and is a very important variable, insofar as it determines the path to be followed. It is expected, here, the recognition of the company's personality, the reason for its existence and innovation, comprising a set of actions that can help the company to achieve its proposed goals.
Learning	This variable is linked to the company's ability to learn, acquire, and disseminate knowledge. It also refers to the ability to realign and formulate new strategies to improve its processes.
Relationships	The relationships involve internal and external relationships. Internal relationships involve the actions between the company's departments, making use of an efficient communication channel to optimize the innovation process. The external relationship refers to the relationship with other agents, such as the interaction in networks and partnerships, through different communication channels.
Processes	In innovation, processes give rise to the way the company will organize itself to achieve its goals, and these processes are established gradually and objectively throughout the development of the product and/or service.
Innovative Organization	It refers to the organization's understanding of innovating. Innovation is a process in which the entrepreneur needs to take risks and evaluate its development. Tidd and Bessant (2015) reinforce that in addition to selecting the idea, it is necessary to outline a strategy, implement and evaluate the gains obtained through the proposed innovation.

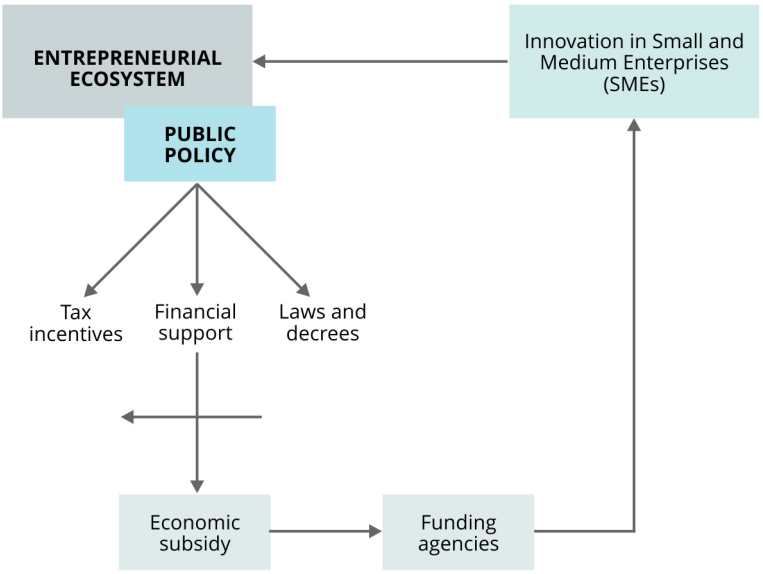
Source: prepared by the authors from Braga Júnior, Silva, and Silva (2015) and Tidd and Bessant (2015).

The average for each of the dimensions is intended to present the strengths and weaknesses of the company, whose values closest to 1, represented by the center of a five-point radar chart, are elements that need attention. A company that shows numbers closer to 1 in each of the categories is unlikely to be successful in its innovation. On the other hand, companies that present higher values have more chances of promoting successful innovations (TIDD & BESSANT, 2015).

Theoretical model for data analysis

Based on the discussion presented, a theoretical model was developed to support the collection and analysis of data, in order to understand the effects of the support of the development agency of the State of Minas Gerais for research and innovation in small and medium-sized companies that were awarded the economic subsidy edict. Figure 1 presents three important dimensions discussed in this work: the entrepreneurial ecosystem, public policies, and innovation in SMEs.

Figure 1 - Theoretical model



Source: elaborated by the authors

The proposed theoretical model takes as reference the entrepreneurial ecosystem model suggested by Isenberg (2011). It is emphasized that the interaction of the domains is important, although the presence of all of them simultaneously is not mandatory for an entrepreneurial ecosystem to be configured (MINEIRO et al., 2016). The proposed model of entrepreneurial ecosystem presents itself as an ideal situation, but it does not imply that entrepreneurship develops only with the presence of all the domains. From this perspective, this study is oriented to deepen the understanding of the effects caused by an economic subsidy to SMEs. The economic subsidy was made available as a result of a public innovation policy and operationalized through research and innovation promotion agencies. In view of the study's objective, the government's role is emphasized, as far as financial aid from the economic subsidy of development agencies is concerned.

The economic subsidy is characterized as a non-reimbursable financial support and should not be taken as a type of financing, because the development agencies do not receive financial return nor the payment of the granted resource. Thus, the objective was to know the effects of the economic subsidy received by small and medium-sized companies awarded by the Tecnova edict, through the FAPEMIG and FINEP agencies.

The financial support referred to in this study, intended for SMEs awarded by the edict, presented itself as a unique opportunity for their development. It is recognized in the literature that financial support for companies to invest in innovation, research and development is important to promote the increase of their competitiveness in their market of operation (COSH & HUGHES, 2010). The assumption of developing

public policies aimed at strengthening R&D in small and medium enterprises means recognizing that the competitive permanence of these organizations results in an economically active market and a contribution to the formation and consolidation of an entrepreneurial ecosystem.

METHODOLOGY

This research is characterized as a single case study. It sought "holistic and significant characteristics of real-life events" (YIN, 2010, p. 24). As for the nature of the research, it is characterized as a qualitative research, aiming at the understanding, in depth, of a given group or elements, with emphasis on the individualities and specificities of the researched objects. The target object of study was the economic subsidy program operationalized through the partnership between the funding agencies FAPEMIG and FINEP - Tecnova Edict 13/2013, whose subunits of analysis are 43 companies participating in the funding.

The 13/2013 Edict launched by FAPEMIG and FINEP had the purpose of supporting proposals that fit into the themes of agribusiness, biotechnology, electro-electronics, alternative energy, environment, mineral-metallurgical, oil and gas, and information technology and communication, besides being an edict focused on the development of SMEs in the state of Minas Gerais (FAPEMIG, 2013). The resources allocated to finance the 13/2013 edict were R$15 million, of which R$9 million were FINEP resources and R$6 million were FAPEMIG resources.

Initially, the execution period for each proposal was 24 months, counting from the signing date of the award term. Each proposal could request a minimum of R$200,000 and a maximum of R$400,000. In return, the company had to invest at least 10% of the requested value in its project proposal. Proposals from companies that fit into the following categories were considered eligible: (i) be a micro - or small-sized company duly registered with the Board of Trade or the Civil Registry of Legal Entities (RCPJ) of its jurisdiction up to six months before the launch of this Tender Protocol; (ii) demonstrate having carried out some activity, asset or financial at least three months before the launch of this Tender Protocol; (iii) have gross revenue, in the last fiscal year, equal to or less than R$ 3 million and 600 thousand; (iv) not have been hired in the MCT/FINEP/FNDCT Public Selection - Economic Subvention to Innovation - 01/2010; (v) commit to providing adequate conditions of space, infrastructure, technical and administrative support personnel, as well as to make available time for the team to dedicate to the proposed project; and (vi) observe specific guidelines contained in the FAPEMIG Manual, from the submission of the proposal until the final accountability (FAPEMIG, 2013, p. 2).

Table 4 presents the list of companies awarded by Public Bid 13/2013, indicating their location and predominant economic activity. The names of the companies were preserved and replaced by alphanumeric identification. The Tecnova program benefited 43 companies, including organizations located in 13 different cities in the state of Minas Gerais.

Table 4 - Companies benefited by the economic subsidy

Identification	City	Predominant economic activity
TEC-09a	Santa Rita do Sapucaí	Development of custom computer programs
TEC-37	Uberlândia	Instrument Manufacturing and Training
TEC-43a	Belo Horizonte	Clinical Laboratory
TEC-44	Lavras	Systems Developer
TEC-51	Uberlândia	Retail sales of computer and telecommunications equipment and accessories, software development, and the provision of computer and telecommunications consulting services, network assembly, web hosting, computer and telecommunications equipment maintenance
TEC-62	Viçosa	Vaccine production for veterinary medicine
TEC-63	Santa Rita do Sapucaí	Electronic Component Manufacturing
TEC-67	Itajubá	Manufacture of electromedical and electrotherapeutic appliances and irradiation equipment
TEC-68a	Belo Horizonte	Technological base specialized in climate change issues
TEC-77	Itajubá	Information Technology
TEC-80	Uberlândia	Technical support, maintenance, other services in information technology, as well as the commercialization of applications and software
TEC-94a	Belo Horizonte	Animal Genetics
TEC-95	Belo Horizonte	Industrial machining, turning and welding
TEC-12a	Alfenas	Research and Development
TEC-14a	Itajubá	Development of projects in renewable energy and carbon
TEC-19	Belo Horizonte	Manipulation Pharmacy
TEC-28	Uberaba	Production, commercialization, importation and exportation of bovine embryos.
TEC-43b	Santa Rita do Sapucaí	Automated Irrigation
TEC-46	Uberlândia	Technology Services
TEC-49	Belo Horizonte	Consulting in chemistry and biotechnology
TEC-59	Juiz de Fora	Development of custom computer programs
TEC-60	Santa Rita do Sapucaí	Development of custom computer programs
TEC-68b	Belo Horizonte	Lighting Industry
TEC-69	Belo Horizonte	Personal Monitoring Services
TEC-79	Santa Rita do Sapucaí	Equipment Manufacturing
TEC-83	Santa Rita do Sapucaí	Manufacture of measurement, test and control devices and equipment.
TEC-84	Santa Rita do Sapucaí	Manufacture of electromedical and electrotherapeutic appliances and irradiation equipment
TEC-90	Viçosa	Engineering
TEC-94b	Timóteo	Technology in recycling and processing of electrical and electronic material, and wholesale trade of waste and scrap metal.

Table 4 (cont.) - Companies benefited by the economic subsidy

Identification	City	Predominant economic activity
TEC-01	Itajubá	Development and licensing of customizable computer programs
TEC-02	Montes Claros	Biotechnology
TEC-03	Ipatinga	Maintenance and repair of hydraulic equipment and pneumatics, except valves
TEC-06	Itajubá	Manufacture of electromedical and electrotherapeutic appliances and irradiation equipment
TEC-08	Santa Rita do Sapucaí	Equipment Manufacturing
TEC-09b	Belo Horizonte	Software development and licensing
TEC-12b	Belo Horizonte	System Licensing
TEC-13	Itajubá	Research and experimental development in natural and physical sciences
TEC-14b	Viçosa	Research and experimental development in natural and physical sciences
TEC-15	Belo Horizonte	Agribusiness
TEC-17	Belo Horizonte	Software maintenance and rental
TEC-22	Itajubá	Wholesale of machinery and equipment for industrial use, parts and pieces
TEC-36	Nova Lima	Custom Software Development
TEC-37	Nova Lima	Data processing, application service providers and internet hosting services

Source: survey data

Through documentation of the organizations, documents and public records, the authors were able to access information regarding the support program. Regarding the techniques for data collection, documentary research, interviews and direct observation were used (YIN, 2010). The documental research meant an early analysis of the reading, reflection and criticism of the documents made available by the funding agency. In order to meet the objectives of the case study, the data were also collected through interviews with the owner partners of the companies awarded by the Edital 13/2013 Tecnova and/or project coordinators.

Among the 43 companies participating in the call for proposals, 34 companies were visited, of which 11 owners were interviewed. The choice of companies visited was made by professional determination of the sector in which one of the authors works, using as a criterion the end date of the project, i.e., companies were visited that were within the project execution period, considering the period between May and August 2017.

Given the general objective of the study to understand the effects of the funding, for data analysis the information from 42 companies was considered, since one company did not submit the final results documentation of the project to FAPEMIG,

also verifying the inactivity (write-off) of its National Register of Legal Entities (CNPJ). As it was not possible to contact them in time for this study, the data from this company were not considered. Table 5 presents an overview of these data. It is noteworthy that, among the companies visited, one corresponds to the company that was not part of the database.

Table 5 - Summary of the companies visited and interviewed

Description	Quantity
Companies selected for the grant program	43
Visited Companies	34
Interviewed Companies	11
Documentary research database	42

Source: survey data

The following documents were part of the pre-analysis: (i) project Work Plan; (ii) Final Technical Monitoring Report of the project; (iii) technical visit report (data available only for the visited companies); (iv) documents and supporting evidence of the activities performed in the project. To explore the material collected from the interviews, the NVivo10 software was used, whose process involved transcribing the interviews, interpreting the records made by the authors, and dividing and coding the data into small clippings.

The categories for coding were elaborated based on the theoretical framework of the study, in order to understand the role of public policies for innovation in the development of small and medium-sized companies, and how these results can be measured, using innovation indicators.

The category "Innovation results" considered the innovation indicators and factors that could influence the development and growth of a SME. The discussion about government support for innovation in SMEs and encouragement of entrepreneurship is of paramount importance for the development and continuity of the activities of these companies. (CARVALHO et al., 2016; ISENBERG, 2011). Thus, we sought to identify the effects of promotion on variables such as training of human resources involved in the innovation process, dissemination of knowledge within the company; variation in the company's productivity, among others. The category "Evaluation of government support" refers to the perception of the interviewed entrepreneurs as to the importance of government support for the generated innovations. Table 6 presents the categories and variables of analysis used in the NVivo 10 software.

Table 6 - Qualitative research categories and analysis variables used in NVivo10 software

Category	Variable	Scope
Innovation Results	Allocation of the financial resources granted	Where and how the project coordinators used the financial resources.
	Knowledge Generation	Project coordinators' perception of the training of the human resources involved in the innovation process and the dissemination of knowledge throughout the company.
	Patents	Number of patents resulting from the granted support.
	Perceived opportunities	Opportunities perceived by the coordinators during the development of the project, as well as the generation and/or improvement of methodologies in the company and the benefit to other projects in the company.
	Publications	Elaboration of publications arising from the carried out project.
	Company Productivity	The coordinators' perception regarding cost reduction, sales increase, and financial variations in the company.
	Conducting market research	Indication from the coordinator about conducting market research during the development of the project.
	Established partnerships	Existence of cooperation between the company and other institutions for the development of the project.
	Qualification of the human resources involved	The coordinators' perception of the titles of the human resources involved in the project.
Evaluation of government support	Economic subsidy as important support for SMEs	Coordinators' perception of the economic subsidy
	Non-technical difficulties faced during the promotion	Report on the non-technical difficulties experienced by the projects
	Cautions for submitting proposals	Perception of the coordinators as to the care that an entrepreneur should take when requesting to participate in development programs
	Suggestions for stimulating innovation in SMEs	Coordinators' opinion regarding government attitudes to encourage innovation in SMEs

Source: survey data

ANALYSIS OF RESULTS

This section begins with information that allows us to contextualize the case under analysis. Then, the results obtained by the companies from the support received were analyzed. In the third part of the section, the public policy implemented by the Tecnova 13/2013 edict was evaluated.

Background of the case

Tecnova 13/2013 was launched in 2013. The submission of projects was done via The Everest System - an operating system adopted by FAPEMIG - where all proposals, for their selection, were evaluated by 11 professors specialized in the areas. In addition to the documentation required in the call for proposals, the submission of proposals also required the preparation of a Work Plan, a document in which the applicants described the project execution plan, timeline and financial execution. As a FAPEMIG requirement, the applicant should also indicate a manager, an institution that would be responsible for the administration of the financial resources, as well as financial accountability during the execution of the project.

The initial deadline for the execution of the program was set for 24 months, as of the signing of the concession agreement. The projects were divided into two technical stages and the transfer of financial resources to the projects would take place in two installments: the first installment upon the contracting of the projects; and the second installment after the execution of 80% of the first stage of execution. However, for financial reasons, the resources destined to the economic subvention - the two financial installments - were deposited with delays for the awarded entrepreneurs, which resulted in the extension of at least 12 months of the initial forecast.

The companies that received the funding, as well as the funding agencies FAPEMIG and FINEP were surprised by the variations in the political and economic scenarios experienced as of 2014, leading to the absence of financial releases in 2014 and 2015, which resulted in a postponement of transfers, later regularized. Among the inconveniences caused by the postponement of the deadlines for the release of funds, we highlight the situation of one of the companies, which spent its own resources to continue the project

The technical monitoring of the execution of the projects occurred throughout the period, being more intense in 2016, 2017 and 2018. In accordance with FINEP, FAPEMIG made technical visits to the companies during the execution of the projects to verify the activities in development. Several supporting documents were required, in addition to monitoring reports - both of the project execution and of the technical visits -, and a final form for the synthesis of the organizations' results. As a strategy to optimize the use of the resources made available by the Tecnova Edict, partner consultancies were integrated and contributed to the consolidation of the studies, helping the participating companies in their managerial development, through the elaboration of diagnoses, mentoring, dialogues and monitoring.

Table 7 presents the characteristics of the companies and projects selected, showing that 50% of the companies planned to develop disruptive innovations - 36% semi-radical and 14% radical. It is also noteworthy that 74% of the projects focused on product innovation, and 62% had a national scope.

Table 7 - Characteristics of the selected companies and projects

Item	Quantity
Number of employees	
2 a 5	13
6 a 9	8
10 a 24	12
25 a 49	3
Not informed	6
Amounts granted	
R$ 269.500,00	15
R$ 308.000,00	6
R$ 346.500,00	8
R$ 385.000,00	5
R$ 423.500,00	5
R$ 462.000,00	3
Execution deadline	
24 to 30 months	10%
31 to 36 months	20%
37 to 42 months	70%
Scope of projects	
National	62%
Regional	0%
International	36%
Not informed	2%
Type of innovation	
Product	74%
Process	10%
Product and Process	14%
Services	2%
Degree of novelty	
Incremental	45%
Semiradical	36%
Radical	14%
Not informed	5%

Source: survey data

Results of the funding for the awarded companies

In the perception of the interviewees, the economic subsidy allowed the growth of the companies, whether in infrastructure, productivity, expansion of relationship networks, besides providing new market opportunities. There was little mention by the interviewees about publications and patents as results of innovation. Similarly, the research showed that, although some patents were filed and some publications were produced, these indicators alone would be insufficient to measure the effects of government support (FORNARI et al., 2015).

The acquisition of machinery, equipment and software, as well as spending on training and introduction of technological innovations in the market indicated positive efforts in companies that innovate (CAVALCANTI & DE NEGRI, 2013; FORNARI et al., 2015; LEAL et al., 2016). Through the carried out interviews, it was verified

that the economic subsidy enabled changes such as the expansion of the companies' infrastructure, deployment and/or improvements in laboratories, purchase of equipment and machinery used to carry out the project; investments that will be reused in the future by the organizations. It was also noticed that the aid enabled the purchase of inputs, chemical and electronic components that would not have been purchased without the financial support.

In addition to material results, there were gains after the application of financial resources in knowledge generation and human resources training (CAVALCANTI; DE NEGRI, 2013; LEAL et al., 2016). Participation in workshops, capacity building training, and human resource development - using financial resources from the grant - were common. Through the documentary research, it was also verified that the knowledge acquired by the companies was specific, in line with the project's focus. Still on capacity building, the interviewees recognized the importance of the participation of the funding agency, whether in consultancies hired by FAPEMIG or in the granting of research grants.

In the case of consultancies, the interviewees mentioned how motivating and essential was the knowledge they passed on to improve internal processes and management practices. As for the scholarships, it was possible to use two models, differentiated by the objective proposed in the financing: (i) grants for technical support to research and (ii) grants for technological development and innovation incentive. The temporary hiring of professionals, with no employment relationship, generated tangible results, such as course completion papers, dissertations and theses that contemplated the projects in execution.

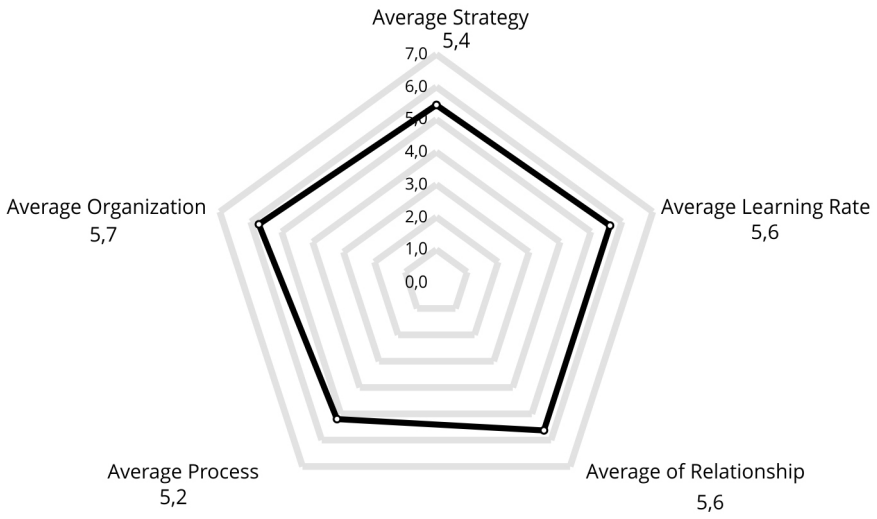
Part of the capacity building occurred due to the partnerships that the awarded companies had and activated during the execution of the project. In many cases, these partnerships were between educational institutions, stimulating the exchange of experience and generation of knowledge (OECD, 1997; LEAL et al., 2016). It is also noteworthy the access to equipment and laboratories of universities, which generated knowledge gain and access to high value-added technologies. Less common was the

interviewees' interaction with foreign researchers and companies. However, six of the interviewed companies verbalized that international interaction represented a source of increase in the quality of projects.

Based on the factors mentioned above, such as improved infrastructure, new opportunities through partnerships, and the involvement and development of qualified professionals, the interviewees highlighted positive changes in their business indicators. According to the interviewees, there were gains in productivity - through the use of new or reformulated methodologies -, cost reduction, by standardizing guidelines, instructions, or initiating financial control; in addition to positive variations in billing, mainly affected by the entry into new markets and the acquisition of technologies still unknown or difficult to access in the domestic market. In some cases, the increase in monthly sales reached 40%.

Aiming to explain the development of the studied organizations, it was chosen the method of the innovation audit (TIDD & BESSANT, 2015). Through this method, it was sought to elucidate, among the listed categories - strategy, learning, relationships, processes and organization - the average development of the 42 companies analyzed and also a cutout provided by the 11 companies that were the target of in-depth interviews. Figure 2 below shows the general average of the companies in the model's categories.

Figure 2 - Innovation Audit applied to the 42 surveyed companies - General average of indicators



Source: survey data

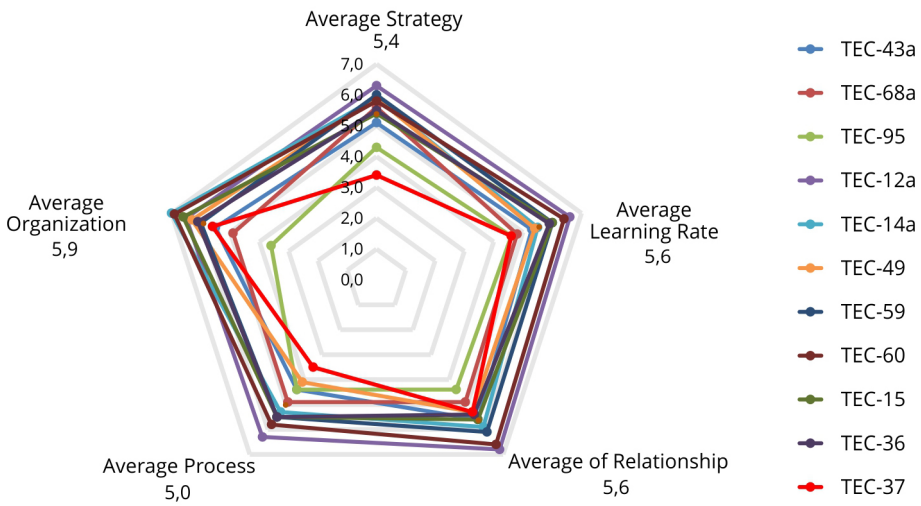
It is noteworthy that the purpose of applying the Innovation Audit is that the values presented by the companies can be used as sources of information to generate improvements. Thus, the critical values for the overall average of the companies will be highlighted.

Among the 42 analyzed companies, the "Process" dimension reached the lowest average - 5.2 - among the categories that make up the evaluation method. This has multiple factors, such as the absence of specific processes that assist in the development of innovation from the beginning to its launch, mistakes in terms of deadlines and budget planning - also caused by the absence of management mechanisms - as well as failures in the involvement of teams during the development of innovation and lack of focus on the choice of innovation.

On the other hand, the "Innovative Organization" dimension obtained an average of 5.7, the highest among the analyzed dimensions. With 81% of responses above grade 5, positive actions in stimulating innovation within the company, participation of employees through ideas and suggestions, teamwork involving the company's departments and the existence of intra-organizational communication facilitating decision making stand out. The index indicates that the companies that participated in the Tecnova edict adopted an active posture in the sense of stimulating innovative processes and made efforts to build an organizational culture that positively welcomes these actions.

In relation to the 11 interviewed companies, the dynamics between the dimensions remained the same. As can be seen in Figure 3 below, the dimension "Process" obtained the lowest general index - 5.0 -, and the dimension "Innovative Organization" remained at the highest level - 5.9.

Figure 3 - Innovation Audit applied to the 11 interviewed companies and average of indicators



Source: survey data

Among the 11 interviewed companies, the greatest variations occurred among the dimensions "Strategy", "Innovative Organization" and "Process". TEC-37, a company that operates in the service sector, obtained the lowest indices in both the "Strategy"

and "Process" dimensions. Regarding the first aspect, the fragility of this company is justified by the lack of clarity in its strategy. As an example, the interviewed entrepreneur reported that employees did not know about the company's goals, and there is also a lack of a structured path for the company's innovation strategy. These facts demonstrate the need for improvements as to the dissemination of strategic goals and actions that can contribute to the development of innovation, corrective actions characteristic of this dimension. As for the "Process" dimension, the company reported not presenting well-defined processes for the development of innovation, also externalizing the non-compliance with deadlines and budgets for its realization.

The TEC-95 result in the "Organization" dimension is also noteworthy in relation to the negatively discrepant values. Representing the industrial sector, this company mentioned that it does not work in partnership with universities and research centers, which could help in the development of innovations. For this reason, TEC-95 also obtained the lowest index among the interviewed companies for the "Relationship" dimension.

Evaluation of government support

After evaluating the results achieved by the organizations surveyed, we sought to verify the importance of the economic subsidy for the companies, in addition to learning about the non-technical difficulties experienced by the interviewees. Through the interviews, it was found that the evaluation of the interviewees in relation to government support was maintained in four main aspects: (i) non-technical difficulties faced during the support, such as the formalities of the subsidy process; (ii) economic subsidy as an important measure, in which the entrepreneurs recognized the viability of projects of a governmental nature with small and medium-sized companies; (iii) suggestions to stimulate innovation in SMEs, grouping possible suggestions for improvements to the process and, finally, (iv) care for submitting proposals.

Among the non-technical difficulties reported by the entrepreneurs, the difficulties involving external obstacles stood out, such as delays in the release of resources and delays in the contracting of the project, two issues that impacted the execution of the projects and were caused by delays from the development agencies. It is noteworthy that the delay in the release of resources did occur, both at the beginning of the project and in the release of the second installment intended for the companies, requiring them to restructure their goals and execution deadlines. This fact led to the dissatisfaction of project coordinators, since in the case of projects dependent on external inputs, the exchange rate variation directly affected the budget stipulated for the project. This fact was also valid for the domestic market, since the national economic scenario, at the time, contributed to price variations in equipment and service contracting. The following testimonials illustrate the complaint regarding the delay in the release of resources.

> The most difficult thing is the bureaucratic issue. It's a lot of bureaucracy. [...] We had, we were lucky that we got a person on the inside who helped us a lot [...] Even with the first installment it was already late (TEC-42).

> [...] The delay we had in the project was because the second installment didn't come out, and the second installment was to hire the company (TEC-68a).

Furthermore, the interviewed entrepreneurs also externalized difficulties in the acquisition of consumables and in their budget restructuring. The need for companies to fit their acquisitions into the norms for bidding and contracting by the Public Administration - Bidding Law no. 8,666/93 - were cited as barriers. Among the examples mentioned was the difficulty in getting three separate quotes for the purchase of inputs or contracting services, something required by the legislation linked to the subsidy process. Such difficulties, coupled with delays in the process, amplified the companies' perception that it was a bureaucratic, complex, or slow process.

However, the interviewees recognized the importance of programs that seek to foster innovation in SMEs, highlighting some care that should be considered by future organizations wishing to participate in similar calls for proposals. Among the suggestions, one can mention the need for the proponent to have a well-established project, with achievable goals and previous knowledge about the implementation and commercialization of the product or service. In addition, they clarified that organizations should keep a well-defined budget and, as a precaution, have a contingency plan to overcome any difficulties.

Finally, the interviewees highlighted other measures that could be developed by the government in order to improve the dynamics of the economic subsidy processes. Among them are specific and continuous calls for proposals, which have greater affinity with the development time of the entrepreneur's idea, so that the development of innovation does not suffer a rupture after the end of the project's deadline and resources. Another suggestion from the entrepreneurs is the maintenance of the incentive to innovation in the companies in a post-project moment, in order to help entrepreneurs in the strategic direction and in the management aspects to facilitate the company's growth after the fostering process. Entrepreneurs emphasize that it is necessary to conduct the post-closure moment so that the projects are not lost and have even more impact. As one of the interviewees points out

> "It gives the impression that the edicts are made for small companies, but in their heads it is as if it were Vale do Rio Doce. Innovation sector, financial sector, sector..., but it is not like that [...]" (TEC-42).

DISCUSSION OF RESULTS

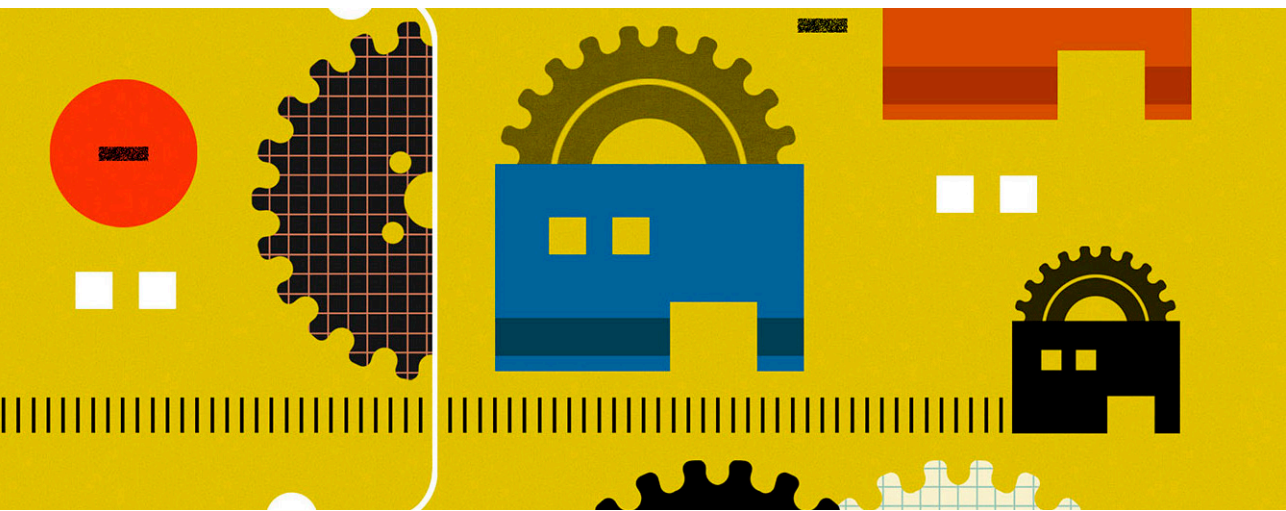
This research sought to investigate the effects resulting from the support to innovation to small and medium-sized enterprises, presenting as a case study the government program of economic subsidy "Tecnova - Edict 13/2013" concluded

between the agencies FAPEMIG and FINEP. Considering that SMEs are important economic players (ACS, 1990; SEBRAE, 2014; 2015) - responsible for generating jobs, new market opportunities, and economic development -, this edict aimed to fund proposals from micro and small businesses, based in the state of Minas Gerais, for the development of innovative products and/or processes.

The financial contribution present in this economic subsidy allowed the access to non-reimbursable financial resources, as support for innovation practices and actions in small and medium enterprises, as recommended in the literature (FUERLINGER, et al., 2015; SILVA & MACHADO, 2008). The program granted, to each company, an average amount of R$ 315,155.10.

In general, the results achieved by entrepreneurs covered not only the traditional ones, such as financial growth, increased productivity and cost reduction, but also provided new opportunities for organizations, such as generation and dissemination of knowledge, building partnerships with other companies and universities, improvement in the qualification/training of employees and even, to a lesser extent, the generation of patents and publications (FORNARI et al. , 2015; OECD, 1997; TIDD & BESSANT, 2015). In addition, the financial contribution also enabled changes in the companies' staff, allowing the entry of academic fellows and researchers, who, in many cases, were absorbed by the company and became part of the staff.

The economic subsidy also allowed access to new facilities for the companies, equipment acquisitions that contributed to the development of the projects and expansion of the organization, in addition to access to high value technologies. Such acquisitions were essential for the projects developed under Tecnova and may also be used for the continuity of innovative research in the organizations (FORNARI et al., 2015). Using the innovation audit method, none of the organizations contemplated was found in the center of the proposed diagram. Thus, immature companies were not observed in the aspect of organizational innovation (TIDD & BESSANT, 2015). However, it was verified that there are points that can be improved so that the organizations maintain their innovative profile and so that the innovation projects do not cease at the end of the support.



Through the interviews conducted with a group of leaders of companies contemplated by the call for proposals, it was found the importance of the economic subsidy as a stimulus for innovation in small and medium enterprises. The statements reinforced that the economic subsidy represents an essential instrument for small entrepreneurs, who often lack financial resources for investments in R&D (BORGES, 2011). On the other hand, the interviewees complained about the absence of programs directed and shaped specifically for SMEs. Given the arguments presented, it was also verified that the programs do not present continuity, and often the products arising from innovation projects do not get to be marketed, due to the lack of incentive and programs that can help in a post-project moment (PACHECO & ALMEIDA, 2013). Still as difficulties listed during the process, it was also cited the "bureaucratic" and slow process of the program; in addition to the obligation, for the acquisition of machinery, to follow the Bidding Law No. 8666/93, which ended up increasing the complexity of the processes of purchasing equipment and materials for research.

FINAL CONSIDERATIONS

The results in terms of innovative products and processes presented by the project coordinators evidenced the importance of public policies as a driving element for innovation in small and medium-sized companies. In this study, represented by the figure of the economic subsidy, it was perceived that government support was considered essential for the development of the small and medium-sized companies benefited by the program, as well as for the promotion of social benefits. It was found that government support is a fundamental element to boost entrepreneurship and innovation, also capable of stimulating the involvement of other players in the ecosystem, such as: formation/strengthening of an innovative culture; development of human resources; involvement of other support institutions such as teaching and research institutions, and creation of partnerships and networks.

However, this study presented limitations regarding the economic data of the innovations, caused by the absence of quantifiable financial information, such as: changes in the companies' revenues - which could not be presented, due to the entrepreneurs' lack of knowledge -, and the absence of information regarding the revenues generated by the innovations, since few projects were already being commercialized. As a suggestion for future research, we indicate investigations that evaluate, in a longitudinal way, the effects of innovation support policies on the development of small businesses, measuring the results in economic terms/business performance, as well as the impacts on social and environmental development of the innovations carried out and commercialized by these organizations.

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