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altibart@gmail.com  
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**Pereira, Bruno Alencar; Figlioli, Aline; Oliveira, Danúsia Arantes Ferreira Batista de; Silva, Emília Rosângela Pires da**

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# Expansion and Evolution of Incubation Programs and Entrepreneurship Development In Incubators In The State of Goiás, Brazil

A EXPANSÃO E EVOLUÇÃO DOS PROGRAMAS DE INCUBAÇÃO E DESENVOLVIMENTO EMPREENDEDOR NAS INCUBADORAS GOIANAS

Bruno Alencar Pereira [bruno\\_alencar5@hotmail.com](mailto:bruno_alencar5@hotmail.com)

*Universidade Estadual de Goiás, Brasil*

Aline Figlioli [alinefig@gmail.com](mailto:alinefig@gmail.com)

*Secretaria de Estado de Des Econômico, Científico e Tecnológico, e de Agri, SED, Brasil*

Danúsia Arantes Ferreira Batista de Oliveira [danusia@alfa.br](mailto:danusia@alfa.br)

*Pontificia Universidade Católica de São Paulo, Brasil*

Emília Rosângela Pires da Silva [emiliarosangela@gmail.com](mailto:emiliarosangela@gmail.com)

*Universidade Federal de Goiás, Brasil*

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**Abstract:** The research aims to address the current ecosystem of innovative entrepreneurship in the State of Goiás and provide an overview of goianas incubators identifying the connections and interactions of the se mechanisms with the different actors involved in the perspective of Triple Helix, to find the support of business incubators as a promoter element of entrepreneurship in regional entrepreneurial development process. The methodology used was based on empirical research, qualitative, descriptive and exploratory nature with a panorama display business incubators of Goiás through a cross-sectional study of 10 incubators associated with Goiana Innovation Network (RGI). The results allowed the generation of innovative entrepreneurship ecosystem mappingand updated overview of the incubation process in Goiás, contributing to the study and identification of the involvement of incubators in the entrepreneurial development process and as a resource for development of institutional policies, actions to streng then the connections the existing ecosystem, ablet of oster and leverage the performance of incubators in support of local and regional development.

**Keywords:** Business incubators, Entrepreneurial process, Incubation process, Evolution indicators.

**Resumo:** O presente artigo tem os objetivos de abordar o atual ecossistema do empreendedorismo inovador no estado de Goiás, Brasil, e exibir o panorama das incubadoras goianas, com a identificação das conexões e interações destes mecanismos com os diferentes atores envolvidos na perspectiva da Hélice Tríplice, para constatar o apoio das incubadoras de empresas como elemento indutor do empreendedorismo no processo de desenvolvimento empreendedor regional. A metodologia usada fundamentou-se em pesquisa empírica, de natureza qualitativa, descritiva e exploratória, com a exposição do panorama das incubadoras de empresas goianas por meio de um estudo transversal com dez incubadoras associadas à Rede Goiana de Inovação (RGI). Os resultados permitiram mapear o ecossistema do empreendedorismo inovador e obter um panorama atualizado dos processos de incubação em Goiás, contribuindo para o estudo e identificação da participação das incubadoras no processo de desenvolvimento empreendedor e servindo como subsídio para elaborar políticas institucionais e ações

para o fortalecimento das conexões do ecossistema existente, capazes de fomentar e potencializar a atuação das incubadoras em prol do desenvolvimento local e regional.

**Palavras-chave:** Incubadoras de empresas, Processos empreendedores, Processos de incubação, Indicadores de evolução.

## INTRODUCTION

Monitoring the dynamics of ecosystems of regional innovative entrepreneurship is relevant to base the allocation of places and resources that offer added value and innovation in competitive areas.

Higher education institutions, innovation centers, federations, associations, entrepreneurship hubs, creative and co-working spaces, and other entities in the state of Goiás, Brazil, make up a promising ecosystem that promotes connections and interactions to support and execute initiatives to create a more entrepreneurial environment for incubators, contributing to prospecting ideas, establishing new businesses, and proposing solutions that strengthen the competitive advantages of the region.

The general objective of the present study was to examine the current innovation ecosystem in the state of Goiás, Brazil, with the identification of connections and interactions between incubators and different agents involved in the formation of the panorama of incubators in that state in 2014. A more specific aim was to verify the function of business incubators as driving elements in entrepreneurship.

The present paper is structured as follows. The first section presents the ecosystem of innovative entrepreneurship in the state of Goiás, with a description of the configuration of connections and interactions with incubators and the process of entrepreneurship development through the support to practices adopted by business incubators and the Cerne model.

The subsequent section brings a reflection on the importance of obtaining data and indicators about the performance and evolution of incubation processes from the reality of each incubator. The used methods are described in the third section. The last section shows results, with an overview of incubators in Goiás in 2014, analysis of mapped data, and conclusions.

### *Ecosystem of innovative entrepreneurship in Goiás*

The integration between agro-industry and modern agribusiness and the emergence of new industrial activities in the automotive and biofuel segments were important to achieve a sustained growth of the gross domestic product in the state of Goiás. Trade also stands out in the economy of the state, because of its strategic location, with the construction of the capital of Brazil and important road axes. In terms of economic logistics, the Goiânia-Anápolis-Brasília axis encompasses the main pole of internal distribution of goods in Brazil (IMB, 2013).

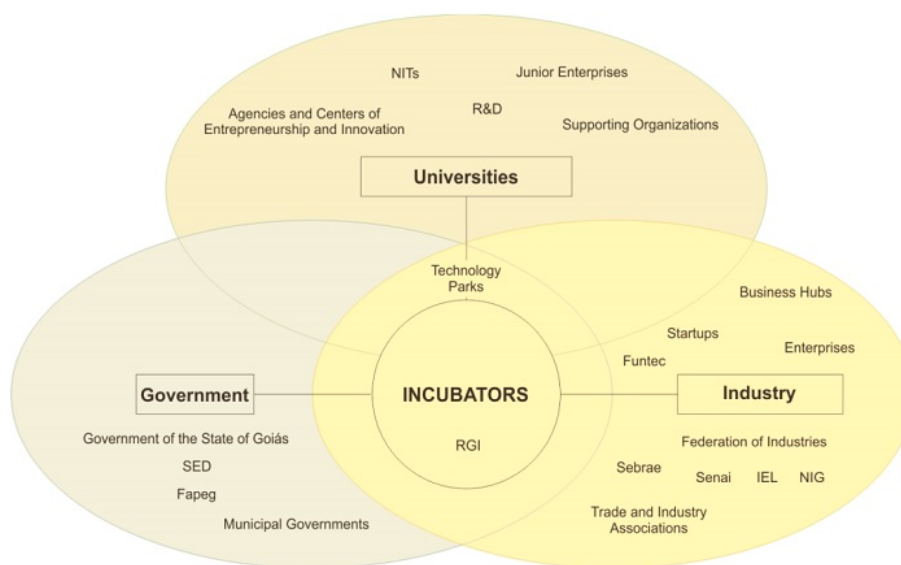
The dynamism present in the state promotes initiatives and encourages organicity and the fulfillment of demands inherent in the process of

technological innovation. This reality raises reflection, analyses, and systematization of opportunities to create an ecosystem that supports ventures and entrepreneurs who develop products, processes, and services that boost innovation in different sectors of the economy.

When the Innovation Law of Goiás - State Law No. 16,922, enacted on February 8, 2010, as stipulated by the Brazilian Innovation Law No. 10,973, enacted on December 2, 2004, came into force, the state of Goiás adopted measures to stimulate scientific and technological research in productive activities to obtain technological autonomy, training, and competitiveness in the process of regional development, which promoted the implementation of innovation systems.

Higher education institutions, innovation centers, federations, associations, entrepreneurship hubs, creative and co-working spaces, and other entities make up a promising ecosystem that encourages connections and interactions to support and execute initiatives to create a more entrepreneurial environment for incubators, contributing to prospecting ideas, establishing new businesses and proposing solutions that strengthen the competitive advantages in different regions of the state of Goiás.

In this scenario, it is necessary to set a pro-innovation movement to support entrepreneurs, to insert them in the participative context of continuous training, research, and fund-raising. To achieve that, it is indispensable to carry out transversal policies that lead to interaction and cooperation between public and private powers, involving the third sector and society as a whole (Bezerra, Medrado & Duarte, 2013). In the present study, interactions and cooperations follow the approach of the Triple Helix, developed by Etzkowitz and Leydesdorff (2009). This model aims to produce knowledge, technological innovation, and economic development, and advocates that innovation results from a complex and dynamic process of experiences in the relationships between science, technology, research, and development in universities, business companies, and governments, in an endless spiral of transitions.



**Figure 1**  
Ecosystem of innovative entrepreneurship in the state of Goiás, Brazil.  
Designed by the authors and based on Etzkovitz and Leydesdorff (2009).

Figure 1 places business incubators in the center of the ecosystem, as elements that drive the existing synapses. Business incubators can encourage integration between environments through conjoint actions and other interactions, either formal ones by means of projects or informal ones by helping establish friendly relationships between managers and supporting organizations. However, it is necessary that isolated actions carried out by the elements that make up the ecosystem can be integrated in interventions with a higher coverage to consolidate existing synapses and the organicity required by a relationship network, materializing the ecosystem, enabling not just to raise and direct funds of the support system, but also compare the contribution of different agents in the network to improve the understanding of how entrepreneurs are connected to the other elements of the ecosystem (Musiolik, 2012).

INOVE, the business incubator of the former Federal Center of Technological Education of Goiás (Centro Federal de Educação Tecnológica de Goiás or Cefet/GO), opened in February 2002, was the first incubator in the state. After the expansion of incubation programs, Goiás has currently 12 incubators. For being driving elements of entrepreneurship and innovation in the state, business incubators are the main source of interaction and coordination of the regional innovative entrepreneurship ecosystem. Through actions and projects formalized between agents or isolated activities, they can raise awareness of, disseminate, and drive the development of entrepreneurial culture, and encourage interactions between universities, governments, and industries to establish businesses and create technological innovation.

Actions such as the conjoint participation in projects approved in the MCT/Finep - PNI/PROININC 03/2009 call for bids and the MCT/Finep/AT - PNI/Incubadoras 12/2010 invitation letter provided a greater interaction between incubators in state of Goiás, with several

activities, such as lectures, production of awareness material, publications, workshops for teams of incubators and entrepreneurs, and seminars. One of the main actions in this context was the 1st Entrepreneurship Olympiad for undergraduate students, carried out in 2014 and involving supporting organizations and different agents of the ecosystem. The IX Regional Meeting of Incubators of the Brazilian Central-West Region (IX Encontro Regional de Incubadoras do Centro-Oeste or IX Erinco) in June 2014, in Pirenópolis, an initiative of the Central-West Innovation Network (Rede Centro-Oeste de Inovação or RedeCO) organized by the Innovation Network of Goiás (Rede Goiana de Inovação or RGI) stimulated the regional ecosystem noticeably.

The 12 incubators in the state of Goiás are: Centro de Empreendedores de Rio Verde (Cerve), created in September 2003 and which is part of the University of Rio Verde (UniRV) in Rio Verde; Athenas, opened in October 2011 and which is part of the Federal University of Goiás (Universidade Federal de Goiás or UFG) in Catalão; Incubadora de Empresas de Base Tecnológica de Jataí or BeeTech, created in March 2015 and which is part of UFG in Jataí; PUC Goiás Business Incubator, opened in September 2012 and which is part of the Pontifical Catholic University of Goiás (Pontifícia Universidade Católica de Goiás or PUC Goiás) in Goiânia; the ULBRATECH Itumbiara technological incubator, launched in April 2012 and which is part of Instituto Luterano de Ensino Superior (ILES/ULBRA) in Itumbiara; the Aldeia Anhanguera Business Incubation Program, created in December 2008 and which is part of the Centro Universitário de Goiás (Uni-ANHANGUERA) in Goiânia; PROIN.UEG, Business Incubation Program of the State University of Goiás, launched in June 2011 and which is part of the State University of Goiás (Universidade Estadual de Goiás or UEG) in Anápolis; Incubadora 3D, Business Incubation Program of Aparecida de Goiânia, created in April 2012; Proine - Centro de Empreendedorismo e Incubação (CEI) of UFG, opened in May 2004 and which is part of UFG in Goiânia; Tecnotex, a business incubator created in June 2004 and which is part of the Municipal Government of Goianésia; UniINCUBADORA, opened in October 2008 and which is part of the Centro Universitário de Anápolis (UniEVANGÉLICA) in Anápolis; and the Uruaçu Business Incubator, which is currently being operationalized, and is which is part of the Municipal Government of Uruaçu.

All the business incubators mentioned in the previous paragraph are related through their supporting organizations to RGI, created in April 5, 2005 to integrate and support business incubators in the state. Its main supporting organizations are the Development Foundation of Tecnópolis (Fundação de Desenvolvimento de Tecnópolis or Funtec) and the Brazilian Micro and Small Business Support Service (Sistema Brasileiro de Apoio às Micro e Pequenas Empresas or Sebrae). Together with government agents and productive sectors, RGI has become the main coordinator of policies and actions oriented to creating and developing incubators in the state of Goiás, and is also the representative

and coordinator institution in the movement of incubators in Goiás into regional and national agencies and institutions. Its coordination with the National Association of Entities Promoting Innovative Enterprises (Associação Nacional de Entidades Promotoras de Empreendimentos Inovadores or Anprotec) stands out in this scenario.

Universities, higher education institutions, and science and technology centers have been awaking to the development of environments that provide for the university-business company relationship to promote innovative entrepreneurship. Business incubators which are part of these institutions stand out for being usually the first environments designed to develop innovative businesses, followed by Technology Innovation Centers (Núcleos de Inovação Tecnológica or NITs). Nevertheless, it is possible to notice a change of pattern toward the creation of new, broader environments for entrepreneurship and innovation, in addition to the improvement of the existing ones.

As for the interaction with governments, the perception regarding public policies and actions oriented to developing incubators and other innovation environments has increased, and involves the government of the state of Goiás, the State Secretariat for Development (Secretaria de Desenvolvimento or SED), through two branches (Economic, Scientific, and Technological; and Agriculture, Livestock, and Irrigation), and the Goiás Research Foundation (Fundação de Amparo à Pesquisa do Estado de Goiás or Fapeg) as agents responsible for funding, support, and motivation to develop incubators and respective actions focused on regional growth.

The government of the state of Goiás, by means of two branches of SED (Economic, Scientific, and Technological; and Agriculture, Livestock, and Irrigation), created from the incorporation of different portfolios, including the former Secretariat for Science, Technology, and Innovation, promotes the formulation and execution of science, technology, and innovation policies, boosts market information technology, fosters professional and technological training, and formulates the state's policy for funding, research, evaluation, and control in higher education institutions kept by the state. The main actions coordinated by this secretariat in the innovation and entrepreneurship fields were the partnership to disseminate established innovation environments and the support to organize events and programs created to offer support for the development of technological innovation in the state, such as the Goiano Program of Technology Parks (Programa Goiano de Parques Tecnológicos or PGTec), launched in 2010 to encourage the implementation of technology parks in Goiás.

The Goiás Research Foundation (Fapeg), created by Law 15,472 in 2005, promotes scientific, technological, and innovation research, contributing to the socioeconomic and cultural development of the state. Since 2011 Fapeg has been publishing public notices focused on the promotion of innovation in business companies. In 2013, the foundation issued the call for bids no. 07/2013, the TECNOVA public notice, to replace the PAPPE-Integração public notice, together

with the Funding Agency of Studies and Projects (Financiadora de Estudos e Projetos or Finep), thus enabling economic support for 35 chosen companies, making available a total value of R\$ 13.5 million. In 2012, Fapeg issued calls for bids no. 14/2012 and no. 115/2012 to support the creation, structuring, and maintenance of NITs and business incubators, respectively, with a total value of R\$ 960,000. In this case, the covered institutions were UEG, UFG, ILES/ULBRA, PUC Goiás, UniEVANGÉLICA, UniRV, Salgado de Oliveira University, and the Federal Institute of Goiás. A new version of this call is predicted for 2015, again oriented to NITs and incubators in Goiás.

It is possible to notice locally the direct operation of the public sector in the development of municipal incubators, as illustrated by the case of Incubadora 3D. Its project resulted from the partnership between the municipal government of Aparecida de Goiânia by means of the Municipal Secretariat of Trade and Industry, Science, and Technology, the Federal Institute of Education, Science, and Technology of Goiás (Instituto Federal de Educação, Ciência e Tecnologia de Goiás or IFG), the Tecnópolis Development Foundation (Fundação de Desenvolvimento de Tecnópolis or Funtec), RGI, and the AparecidaTec Science and Technology Institute. A similar case can be found in Goianésia, with the Tecnotex incubator. In Anápolis, the participation of the local public sector in the promotion of innovative entrepreneurship is also recognized because of the coordination of the Municipal Secretariat of Science, Technology, and Innovation with PROIN.UEG, from UEG, and UniINCUBADORA incubators. One of the most important activities in this context was the Empreende Anápolis project, carried out in 2014 to disseminate conjoint actions to raise awareness of innovative entrepreneurship and incubation programs that existed in the city. This secretariat is also related to RGI and Anprotec, and coordinates actions with local incubators and initiatives to implement a technology park in the city.

From the perspective of interaction with industries shown in Figure 1, it is possible to understand the variety of involved agents, which, despite not being systemically coordinated, promote connections with business incubators in initiatives that reveal significant potential for regional development.

The Brazilian Micro and Small Business Support Service (Sebrae) interacts with all business incubators and supporting organizations, and is notoriously one of the most active agents in the incubation movement and regional and national entrepreneurship development.

The Tecnópolis Development Foundation (Funtec) is a nonprofit private institution that sponsors technological innovation in the state of Goiás. Established in 1994, it acts with the Federation of Industries of Goiás (Federação das Indústrias do Estado de Goiás or FIEG) and RGI promoting, encouraging, sponsoring, and coordinating projects and technology development in several sectors of society to obtain local and regional growth, in a continuous and coordinated practice. The support offered by Funtec to advance innovative entrepreneurship is especially

important in two specific interventions: the Innovation Data Technology Platform (Plataforma Tecnológica de Dados para Inovação) and Funtec Publications for the Promotion of Innovation Actions in Goiás (Editais Funtec de Fomento às Ações de Inovação em Goiás). According to Bezerra et al. (2013), in an unprecedented initiative for the productive sector of Goiás, Funtec aims, through the first action, to establish a mechanism that supports information about innovations of business companies in Goiás to sponsor entrepreneurial and governmental initiatives oriented to innovation. The Funtec Publications for the Promotion of Innovation Actions in Goiás (Editais Funtec de Fomento às Ações de Inovação em Goiás), issued in 2014 and 2015, subsidize projects with the following lines: I – support to incubators and incubated companies; II – support to networks that promote innovation; III – support to projects that boost the Innovation Data Technology Platform (Plataforma Tecnológica de Dados de Inovação); and IV – support to innovative projects. The total amount made available in 2014 and 2015 was R\$1,064,700.

The Federation of Industries of Goiás (FIEG) is an institutional partner of several incubators in Goiás, acting as a relevant agent that integrates the productive sector with innovation environments, contributing for incubators to be more active in the development of products and services originated in regional industries and business companies. With Business Mobilization for Innovation (Mobilização Empresarial pela Inovação or MEI), stimulated by the Brazilian National Confederation of Industry (Confederação Nacional das Indústrias or CNI), FIEG created the Innovation Center of Goiás (Núcleo de Inovação de Goiás or NIG) to raise awareness of companies of opportunities to innovate, expand the participation of industries in the innovation agenda, and work conjointly with the government.

The Brazilian Service of Industrial Apprenticeship (Serviço Nacional de Apoio a Indústria or SENAI) has been playing an important role in disseminating technological innovation regionally, by offering technology solutions that allow innovation for micro and small companies. Its demand corresponds to incubated enterprises for the specific development of solutions complementary to its projects. This organization, together with the Industry Social Service (Serviço Social da Indústria or SESI), is also regionally responsible for the Edital SENAI SESI de Inovação, disseminating and offering support to the development of innovative projects, by funding projects including companies of any size from the industry sector, such as startups and incubated enterprises.

Entrepreneurship hubs aim to support entrepreneurs in business-related challenges, orienting or promoting actions so ideas, startups, and companies have special help to develop and may interact with a group of entrepreneurs. Such environments can be found in the state of Goiás, as illustrated by the PontoGet, Modul Coworking, BIZ Center, Teia Coworking and Trama Coworking co-working spaces, located in Goiânia, as well as Coletivo Centopeia, the Empreendedores

Inquietos community, and Anavalley, a collaborative community created in Anápolis.

Trade and industry associations in the state of Goiás and representative class entities endorse entrepreneurial actions related to incubators through institutional support and dissemination of activities that may benefit the economic development of local businesses. The Association of Young Entrepreneurs and Entrepreneurs of Goiás (Associação de Jovens Empreendedores e Empresários de Goiás or FAJE Goiás) and the Technology Community of Goiás (Comunidade Tecnológica de Goiás or Comtec) stand out among relevant associations and communities.

The current ecosystem reveals that the innovative entrepreneurship scenario in Goiás has been developing consistently, which points to the need to implement public policies that consolidate existing connections and those under development to meet specific needs of entrepreneurs and other agents.

By doing so, these policies will strengthen the systematization of actions oriented to the process of entrepreneurship development promoted by regional interactions, integrating governments, universities, industries, and business incubators. The setting provided by a consolidated ecosystem enables entrepreneurs to identify and explore opportunities offered by different factors (Bollingtoft & Ulhøi, 2005).

According to Mian (1997), assistance to new businesses through support services, as well as entrepreneurship development, contribute to the success of new products and services developed by these enterprises.

The aid given by business incubators and the support of the innovation system help products and services developed by incubated enterprises have access to the market.

### *Indicators of evolution and performance of incubation processes*

Brazilian business incubators guided by the Reference Center to Support New Ventures (Centro de Referência para Apoio a Novos Empreendimentos or Cerne) as performance models created by Anprotec and Sebrae intend to improve the results in favor of entrepreneurship development, both quantitatively and qualitatively, to increase the capacity of incubators to design and implement successful enterprises systematically (Anprotec, 2014). However, although this model is broadly applied by business incubators in different regions of Brazil, it is possible to identify a gap regarding the use of indicators and results that demonstrate the evolution of regional incubation processes.

Data from the Study, Analysis and Propositions about Business Incubators in Brazil Estudo (Análise e Proposições sobre as Incubadoras de Empresas no Brasil), a technical report, produced by Anprotec and the Ministry of Science, Technology, and Innovation and published in 2012, shows the role of incubators in the development of different regions of the country. The document reveals that there are 384 incubators in Brazil, which offer services to around 3.8 business companies, including associated and incubated ones. In these environments, more than 2.5

thousand companies graduated. They make R\$ 4.1 billion and create 30 thousand jobs (Anprotec, 2014).

According to Ferreira, Abreu, Abreu, Trzeciak, Apolinário and Cunha (2008), indicators and studies that reveal the situational overview of incubators and incubated enterprises, such as the material issued by Anprotec, establish mechanisms that generate visibility for the performance of incubated companies and incubators and emphasize their quality characteristics, making the business environment safer and more controlled, attracting a higher number of investors and consequently drawing attention to the process of evolution and performance of incubators.

To obtain a regional panorama of incubators in the state of Goiás, the present study adapted the parameters used as references by UBI Global's Index Benchmark Survey 2014. This is an European research initiative about the performance of university incubators carried out by UBI Global, located in Stockholm, Sweden, to define indicators based on critical success factors, key management areas, and the incubators' processes themselves. UBI Global's Index Benchmark Survey uses 60 key business incubator performance indicators, named Key Performance Indicators (KPI) to classify incubators. The 60 KPIs include quantitative data such as annual revenue, number of created jobs and initial public offerings, and investments, and qualitative information, such as quality and quantity of advisors, mentors, services, and negotiations. Variables such as incubator type, ecosystem, age, and operation areas are also taken into consideration (UBI Index, 2014).

## Methodology

The present investigation was empirical and exploratory, with a qualitative and descriptive nature, carried out through a multicase study that allowed to examine the current panorama of business incubators in the Brazilian state of Goiás. The study was structured as a survey, with the use of an online research questionnaire designed in the Google Docs platform as a data collection instrument. The survey was applied in 2014 in ten business incubators in the state of Goiás. The gathered information was analyzed descriptively and reported in the present study. Table 1 shows the identification and description of the respondents.

**Table 1**  
Characteristics of business incubators that answered the questionnaire.

| Incubator name   | Date of creation | Institutional affiliation                             | Municipality in the state of Goiás | Incubator type   |
|--|------------------|---|------------------------------------|------------------|
| Centro de Empreendedores de Rio Verde (Cerve)  | 09/30/2003       | Universidade de Rio Verde (UniRV)                     | Rio Verde                          | Mixed            |
| Incubadora Athenas   | 10/18/2011       | Universidade Federal de Goiás (UFG)                   | Catalão                            | Technology-based |
| Incubadora de Empresas PUC Goiás   | 09/09/2012       | Pontificia Universidade Católica de Goiás (PUC Goiás) | Goiânia                            | Mixed            |
| Incubadora Tecnológica iULBRATECH Itumbiara  | 04/17/2012       | Instituto Luterano de Ensino Superior (ILES/ULBRA)    | Itumbiara                          | Technology-based |
| Programa de Incubação de Empresas: ALDEIA ANHANGUERA                                   | 12/08/2008       | Centro Universitário de Goiás (Uni-ANHANGUERA)        | Goiânia                            | Mixed            |
| Programa de Incubadoras da Universidade Estadual de Goiás (PROIN.UEG)                  | 06/02/2011       | Universidade Estadual de Goiás (UEG)                  | Anápolis                           | Technology-based |
| Programa de Incubação de Empresas do Município de Aparecida de Goiânia - Incubadora 3D | 04/24/2012       | Prefeitura Municipal de Aparecida de Goiânia          | Aparecida de Goiânia               | Mixed            |
| Proine - Centro de Empreendedorismo e Incubação da UFG - CEI                           | 05/05/2004       | Universidade Federal de Goiás (UFG)                   | Goiânia                            | Technology-based |
| Tecnotex Incubadora de Empresas  | 06/22/2004       | Prefeitura Municipal de Goianésia                     | Goianésia                          | Mixed            |
| UniINCUBADORA  | 10/23/2008       | Centro Universitário de Anápolis (UniEVANGÉLICA)      | Anápolis                           | Mixed            |

Designed by the authors.

The questionnaire (Appendix A) used in the survey had 67 questions with closed-ended answers adapted from UBI Global's Index Benchmark Survey 2014. The questionnaire was made available online and applied in June 2014. The respondents were managers of the business incubators affiliated to RGI. The questionnaire was sent by e-mail.

It is important to stress that, because the study was carried out in 2014, BeeTech and Incubadora de Empresas de Uruaçu were not included in the panorama, given that they were created in 2015.

## Results

Table 2 lists a summarized overview of business incubators in Goiás in 2014 and the main aspects examined. The discussion of results that follows the table helps understand incubation programs in this Brazilian state.

**Table 2**  
Overview of business incubators in the state of Goiás, Brazil, in 2014.

| Main indicators   | Results  |
|---|--|
| Institutional affiliation of incubators   | 80% are part of universities, higher education institutions, and science and technology centers 20% are part of municipal public governments   |
| Types of incubators   | 40% are technology-based and oriented to the creation and intense use of technologies 60% are mixed and oriented to local and sectoral development   |
| Coverage of operation and incubation  | 70% with local activities, in the municipality 30% with regional activities across the state of Goiás  |
| Number of incubated enterprises (projects and companies)  | 56   |
| Covered sectors of the incubated enterprises  | Information and communications technology = 54.83% Agribusiness = 16.13% Biotechnology and nanotechnology = 9.68% Machinery and equipment = 9.68% Environment and natural resources = 6.45% Drugs and medicines = 3.23%  |
| Average annual budget of incubators or supporting organizations for operationalization                                      | Between R\$ 50,000 and R\$ 100,000   |
| Average annual revenue or financial resources generated by incubators (incubation taxes, public notices, and other sources) | Between R\$ 100,000 and R\$ 150,000  |
| Allocation of financial resources in the operationalization of incubators   | Direct support to incubated entities = 28.1% Costs with human resources (salaries of the teams and hiring of professionals) = 26% Infrastructure and equipment = 21% Training and qualification of incubator teams = 9% Events = 9% Marketing and communication = 6.9%   |
| Main reasons for the success of incubators in the opinion of managers   | Close relationship with graduate companies = 19.21% Visibility and publicity = 19.21% Capacity to attract or prospect for high-impact projects = 14.69% Facility to establish contacts and networks = 13.56% Competent and committed stakeholders = 13% Qualified consultants and advisors = 11.86% Guarantee of financial resources = 8.47%                   |
| Number of investors that are part of the network of incubators (venture capital, angels, etc.)                              | 27   |
| Financial resources already invested by investors in incubated projects or companies  | Between R\$ 300,000 and R\$ 500,000  |
| Number of sponsors of incubators (local, regional, national, and international)   | 15   |
| Average number of collaborators in each incubation team   | 4  |
| Periodicity of selection processes of incubators  | 40% annual 60% continuous submission   |
| Enterprise selection process  | Average annual number of projects or companies registered in selection processes of incubators = 10.7<br>Average annual number of projects or companies accepted = 6.5   |
| Origin of incubated projects or companies   | Academic/originated in the institution = 40% External entrepreneurs = 31.5% Projects of established companies = 20.5% Professors/researchers = 8%  |
| Main innovations identified in incubated enterprises  | Innovation in products and services = 57.5% Innovation in organizations and businesses = 23% Innovation in processes = 11% Innovation in marketing = 8.5%  |
| Average time that incubated enterprises remain at incubators  | Between 2 and 3 years  |
| Percentage of companies that stay in the region after graduation  | 85%  |
| Most relevant services offered by incubators to incubated entities according to the perception of managers                  | Consulting and advisory = 25% Space and facilities = 20% Fund-raising and investments = 20% Access to markets, networking, and partners = 17.5% Access to laboratories, research, and proximity to professors and researchers = 12.5% Innovation management and technology development = 2.5% Support for intellectual property and technology transfer = 2.5% |
| Percentage of efforts directed to each dimension of development of incubated enterprises (Cerne)                            | Market = 23.5% Management = 23% Technology = 10% Capital = 10% Entrepreneurship development = 15.5%  |
| Total number of jobs created by incubated companies   | Indirect = 79 Direct = 72  |
| Total number of jobs created by graduate companies  | Indirect = 53 Direct = 150   |

Designed by the authors.

The results reveal the significant representativity of universities as supporting organizations of the studied incubators. They represented 80% of the affiliation of the entities grouped in Table 2. The totality of the incubators is located in urban areas, which does not prevent the institutions from taking technological projects on in rural zones.

The central mesoregion of the state of Goiás stands out regarding the number of established incubators – three in Goiânia, the capital of the state, two in Anápolis, and one in Aparecida de Goiânia. This significant concentration emphasizes the potentiality of these municipalities, but also indicates the need to extend the coverage of these incubators to other mesoregions in the state.

All of the examined incubators are nonprofit institutions. Their average annual budget is approximately R\$ 50,000 to R\$ 100,000, and their average annual revenue, or the amount of financial resources they make, including incubation rates, public notices, and other sources, is around R\$ 100,000 and R\$ 150,000.

The resources originated from supporting organizations, incubation rates, and projects approved in public notices represent the main sources of funds used by incubators. Regarding public notices and projects developed by incubators in Goiás, the most frequent fund sources are RGI, Funtec, Fapag, Finep, and Sebrae. Most funds used in the operationalization of incubators are oriented to direct support to incubated entities, costs related to human resources, infrastructure, and equipment, which total 75% of the total cost.

The present study identified the presence of 56 incubated enterprises, including projects and business companies. The information and communications technology sector was responsible for 54.83% of the incubations, followed by agribusiness, with 16.13%. Among the 56 incubated enterprises, 25.49% were in the preincubation category, 33.33% in the incubator resident modality, and 41.18% belonged to the non-resident class, with an average incubation time of two to three years. Empirically, it is noticed that the high rate of non-resident incubation is caused by the capacity of the physical structure of incubators to meet a higher number of enterprises installed in their own head office, which points to the need to scale-up the service of incubators.

Among the types of innovations listed by the Organization for Economic Co-operation and Development in 2007, the most frequent ones in the examined incubated projects were innovations in products and services (57.5%), in organizations and businesses (23%), in processes (11%), and in marketing (8.5%).

Although the studied incubators had 27 investors in their networks, the results show that there is the need to attract more investors. Only two enterprises actually received investments. UniINCUBADORA stood out in this item for receiving between R\$ 300,000 and R\$ 500,000 for incubated enterprises.

Concerning fund-raising by projects designed by incubated enterprises with the support from incubators in innovation public notices, it was

found that 12 projects received subsidy from different sources, such as PAPPE Integração public notices, PRIME, Tecnova, and Funtec, among others. Similarly, 41 projects submitted by business incubators in Goiás were chosen to be funded and thus develop, consolidate, and support the incubated enterprises.

It is noteworthy that there was little data available about the total profit obtained by all of the graduate companies or those in incubation referring to products or services developed with the support of incubators. This indicator is relevant for providing information about the financial health and results of incubation processes. Only three incubators monitored this parameter and calculated an average annual projection of the average profit generated by their incubated or graduate enterprises. This reality reveals a critical factor to be taken into account by incubators in Goiás regarding development indicators. Only 30% of the examined incubators required participation in their businesses in the form of royalties and no incubator participated or solicited participation in the society of incubated or graduate enterprises.

According to the perception of managers, the main factors that contributed to the success of the examined incubators are the close relationship with graduate companies (19.21%), visibility and publicity (19.21%), capacity to attract or prospect for high-impact projects (14.69%), facility to establish contacts and networks (13.56%), competent and committed stakeholders (13%), qualified consultants and advisors (11.86%), and the guarantee of financial resources (8.47%). These results exemplify the concern of managers to keep a relationship with graduate companies. In addition, they reveal that these professionals pay attention to the way incubators are construed and divulged by partners, entrepreneurs, and the community.

As for the most relevant services and supports offered by incubators to incubated entities, managers emphasized consulting and advisory (25%), space and facilities (20%), fund-raising and investments (20%), access to markets, networking, and partners (17.5%), access to laboratories, research, and proximity to professors and researchers (12.5%), innovation management and technology development (2.5%), and support for intellectual property and technology transfer (2.5%).

Another problem faced by incubators is the absence of a significant number of active collaborators. The average number of part-time collaborators was three, and one if only full-time activity is considered. Approximately 60% of the inspected incubators have a council or committee that supervises the institution, helping in strategic decision-making and operations; in contrast, 40% of the incubators do not have a deliberative body. It is not possible to identify whether this fact can be justified by lack of institutional strategic support or the strategic autonomy given to the managers of these incubators.

Regarding selection processes carried out until the period of data collection, 40% had annual processes and 60% used the continuous submission system. The average annual number of applications of projects or companies was 10.7 per incubator, from which 6.5 were approved to

be incubated. PROIN.UEG and Proine, from UFG, sum 50 submissions per year on the average, representing 46.72% of the total number of enterprises in incubation public notices in Goiás.

All of the incubators carried out actions oriented to disseminate entrepreneurship to prospect for projects, which contributes to reach a higher number of applications in selection public notices. However, the results indicate an absence of systematization of awareness and prospection activities, and reveal that 30% of the incubators in Goiás have frequent interventions based on a preestablished schedule. It is known that an increase in the number of dissemination actions may lead to a significant increase in the number of good projects selected by incubators.

The origin of incubated projects or companies was diverse. First place was occupied by academic proposals or projects originated in the institution (40%), followed by external entrepreneurs (31.5%), projects of established companies (20.5%), and ideas from professors or researchers (8%). These results confirm the relevant participation of the academic community in incubation processes. Analysis of data showed the existence of 4.4 professors or researchers, on the average, supporting the development of each incubator.

Half the investigated incubators had graduate enterprises, a consequence of the recent creation of most incubators in Goiás. Most of these institutions with post-incubation companies (85%) have been successful in keeping the companies in the region. This does not prevent the companies to develop their activities in other states or even other countries, but there is no perception regarding incentives and consolidated actions to prepare enterprises for an internationalization process.

It was observed an incipient implementation of Reference Center to Support New Ventures (Centro de Referência para apoio a Novos Empreendimentos or Cerne). Six incubators had not begun their implementation process, three were in the initial phase of implementation, and only one was in the final stage. When the questionnaire was applied, it was noticed that Proine and UniINCUBADORA, chosen in the Business Incubators - Sebrae/ Anprotec N° 01/2011- Cerne Type 1 Practices - Public Notice, were those with the best conditions to implement Cerne. However, a significant fraction of the managers from the studied incubators already had a certificate of participation in the Workshop of Leveling and Implementation of the Cerne 1, promoted by Anprotec.

Regarding the offer of specific and personalized services according to the phase of development of each enterprise, it was found that 20% of the incubators could not systemically provide the support to the specific demands of enterprises and 80% offered services according to their level of maturity and incubation phase.

Monitoring of the development of incubated enterprises through diagnoses and evaluations showed no linearity. Three incubators did the process monthly, two executed it quarterly, and three carried out the assessment semiannually. As for monitoring of graduate companies,

the survey revealed that, among the five incubators with this type of organization, just one monitored the evolution of the institutions in the post-incubation phase using formal mechanisms, such as meetings, reports, diagnoses, and others. This result contradicts in practice the perception of managers, who mentioned the close relationship with graduate companies as one of the main causes of success of the incubator. Similarly, data showed that 30% of the incubators had graduate companies that participate in the actions of the incubator actively when invited. Among this group, just one had a portfolio of actions of which graduate enterprises could participate continuously.

During the existence of incubation programs, 29 enterprises were requested to leave the incubators before graduating. This result has to be seen as a critical indicator, and requires deep examination about the motivations that resulted in the decision of the incubators to break off with some enterprises.

Concerning the item referring to actions promoted by the incubators in the field of intellectual property and technology transfer, the number of initiatives was low, with only four patents and one technology transfer completed. This result calls for a greater concern by incubators regarding intellectual protection and a better way to explore the developed technological innovations.

The diversity of places and specificities of activities of each incubator makes up an interesting panorama of incubation programs in the state of Goiás. The results offer relevant insights into the subject and allow to outline the conclusion of the present study.

## Conclusion

The scenario of innovative entrepreneurship in the state of Goiás has been being set up according to the Triple Helix model, as demonstrated by the ecosystem described in the present study. Nevertheless, there is the need to implement actions and public policies that consolidate the junctions of existing connections and meet the specific needs of entrepreneurs and agents, strengthening the systematization of activities oriented to the process of entrepreneurship development promoted by regional interactions between government, universities, and industries, working together with business incubators.

To understand incubation programs in Goiás, the present investigation gathered important information and summarized it as a panorama of business incubators in the state in 2014, including the main examined aspects and a discussion of results. They provided an up-to-date overview of incubators, with data and indicators, contributing to the determination of the participation of these mechanisms in the process of entrepreneurship development.

One of the main practical limitations of the present study is the transience of data, collected in 2014. Information referring to 2015 was not searched yet. Another limitation is the absence of similar studies

referring to previous years to present a more complete set of indicators of expansion, performance, and evolution of incubation programs in Goiás.

The present investigation opens perspectives for new studies on entrepreneurship development and panoramas of incubators and can be used as a model for similar surveys in other regions of Brazil. Some research questions related to this subject that raise interest in both academic and practical fields are: What are the impacts of the support of incubators on the success of incubated and graduate enterprises? What indicators related to entrepreneurship development can be used to identify results about the activity of incubators in the creation of successful enterprises?

The potential studies that can be designed from these questions allow new agendas to empirically test the connections between different agents and the support offered by incubators and the entrepreneurship development of incubated entities, with their complete market insertion.

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## APPENDIX A

### *Research questionnaire applied to business incubators*

#### A – INTRODUCTION

- 1 Official name of the business incubator:
- 2 University/Supporting organization:
- 3 Municipality:
- 4 Does the incubator provide assistance to the whole state of Goiás?
- 5 Location

#### B – INCUBATOR PROFILE

- 6 - Year of creation of the incubator:
- 7 - Is it a for-profit incubator?
- 8 - What is the incubator type?
- 9 - Category of relationship of the incubator:
- 10 - Full name of the manager of the incubator:
- 11 - Mission of the incubator (describe the strategic focus of the incubator):
- 12 - Companies/projects incubated by sector:
- 13 - Annual budget for the incubator (excluding resources from public notices or funding):
- 14 - Modalities of companies/projects incubated (inform the quantity in each modality):
- 15 - Financial resources generated annually (from all sources) by the incubator:
- 16 - What are the main sources of financial resources in the incubator?
- 17 - Allocation of financial resources in the operationalization of the incubator:
- 18 - How many institutions provide the incubator with financial support?
- 19 - Cite the full name of the three main institutions that provide the incubator with financial support:

20 - Are resources supervised by the institutions that provide the incubator with financial support? If the answer is yes, how many times a year the resources are supervised?

21 - What networks or associations is the incubator a member of currently?

22 - Does the incubator have seed capital funds to invest in incubated projects or companies?

23 - Does the incubator solicit participation in the profits of the enterprise to be developed when accepting to invest in projects or companies?

24 - Does the incubator solicit participation in the society of the enterprise to be developed when accepting to invest in projects or companies?

25 - Factors related to the success of the incubator:

26 - Number of investors that belong to the network of the incubator (venture capital, angels etc):

27 - Financial resources invested by investors in projects or companies of the incubator:

28 - Number of events organized and co-organized by the incubator per year:

29 - Number of sponsors (local, regional, national, and international) of the incubator:

30 - Number of cooperations formalized with other institutions (local, regional, national, and international) that contribute to the development of the incubator and incubated entities:

31 - Number of part-time collaborators of the incubator:

32 - Number of full-time collaborators of the incubator:

33 - Number of members of the management team (direction) of the incubator:

34 - Does the incubator have a council or committee that supervises it?

35 - Average number of projects or companies enrolled per year:

36 - Average number of projects or companies approved for incubation per year:

37 - Number of professors and researchers that support the development of the incubator and incubated enterprises:

38 - What is the percentage of projects or companies in incubation originated in universities (including the participation of former students)?

39 - What is the percentage of projects or companies that have in their team at least one member who has already been an owner or partner of another company?

40 - In what phase are projects when they get into the incubator?

41 - What is the percentage of companies that remain in the region after graduation?

42 - Average time incubated enterprises are kept in the incubator:

43 - What are the most relevant services offered by the incubator to incubated entities?

44 - Application of the Centro de Referência para Apoio a Novos Empreendimentos - CERNE 1:

45 - What dimensions of incubated entities are advisory, consultancy, and other supporting activities oriented to?

46 - What are the main innovations identified in incubated enterprises?

47 - Where do incubated projects or companies come from?

#### C – RESULTS

48 - Does the incubator carry out activities related to the dissemination of entrepreneurship to prospect for projects?

49 - Does the incubator have a well-defined selection process?

50 - Does the incubator offer specific services according to the development phase of each enterprise to obtain results?

51 - Does the incubator carry out periodic diagnoses or evaluations to monitor the development of incubated entities?

52 - Does the incubator supervise and monitor the development of graduate companies after the incubation process?

53 - Do graduate companies actively participate in the activities of the incubator?

54 - What is the number of graduate companies that provide the incubator with financial support (royalties, rates, sponsorship, etc)?

55 - Number of graduate companies since the creation of the incubator:

56 - Total number of indirect jobs created by incubated companies:

57 - Total number of direct jobs created by incubated companies:

58 - Total number of indirect jobs created by graduate companies:

59 - Total number of direct jobs created by graduate companies:

60 - Number of patents generated in the incubator by enterprises that were or are incubated:

61 - Number of technology transfers occurred in the incubator:

62 - Number of enterprises that had projects approved in public notices:

63 - Number of enterprises that received investments or were funded by investors:

64 - Number of projects approved by the incubator in public notices or other sources:

65 - Number of papers published in scientific journals, presented in scientific conferences or other types of publications:

66 - Total profit obtained by all incubated companies (previously and currently). (Profit related to products or services developed with the support of the incubator):

67 - How many projects or companies were requested to leave the incubator before graduation?