

TRIPLE HELIX IN PRACTICE
THE MINAS GERAIS STATE EXPERIENCE

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Abstract

The aim of this paper is to present the experience of a Brazilian State, named Minas Gerais, in implementing the Triple Helix methodology as a State policy for achieving sustainable economical and social growth by strongly investing in Science, Technology and Innovation. The State policy for Science, Technology and Innovation is presented. A unique methodology for articulating government, enterprise and universities - entitled SIMI - is presented in full and the arguments supporting the strategy are deeply discussed. Three cases involving open innovation, science parks and the attraction of R&D international centres are presented to demonstrate the success of the proposed approach. This approach is fully supported by the State Agency for Research Development - FAPEMIG.

Keywords

Triple Helix; Open Innovation; Science Parks; ST&I Public Policy; R&D Centres

Introduction

The search for innovations, which might bring a better quality of life to society, is a result of the challenges faced by mankind which make experiences beyond imagination possible. As a result of the global economic crises, the last few years have registered a change

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of the balance of progress from the advanced countries to the developing ones. Moreover, Brazil is fully involved in these global changes and has increased the role it plays in this new scenario.

Minas Gerais, a central state in Brazil, has realized the importance of using Triple Helix methodology as a government policy for developing sustainable social and economic growth. An important strategy has been to invest significant amounts of money in Science, Technology and Innovation - ST&I - through strengthening its State Research Agency - FAPEMIG - and articulating its policies, conducted by the Science, Technology and Higher Education State Secretary - SECTES, with universities, research centres and industries.

Investing public money to foster technological innovation has been a brand new initiative in Brazil as a whole and in Minas Gerais in particular. This initiative has been made possible after the approval of the National Innovation Law (2004) and the State Innovation Law (2008). The latter was designed by FAPEMIG and supported by SECTES. This was an important point given that these State entities are the ones responsible for the scientific and technological innovation in Minas Gerais from the public point of view.

Furthermore, from 2003 onwards, the State Government decided to invest in ST&I as a vital pillar for achieving economic and social development which could be sustainable in the future by generating innovative products which are competitive in global terms. As a result, FAPEMIG had its annual budget increased by ten times which, in turn, has reflected in the improvement of the research statistics (i.e. paper, projects, thesis, patents) for the State researchers and institutions as a whole. This budget has annually been around US\$ 150 million for six years in a row. The budget combined with the Innovation Laws made it possible, for the first time in the State, to invest significant amounts of money in technology based industries, open innovation initiatives and also to support the new born Science and Technology Parks Programme.

Minas Gerais State Policy

The current State Policy was settled in a major long term plan proposed by the government (in 2003) named Minas Gerais Planning for Integrated Development - PMDI (an acronym in Portuguese) [1] approved by the State Legislature. It was conceived based on the fact that the State needs to be more competitive within the country and abroad by generating products and services which embody high technology and innovation. This is currently around 10% of the State's income and should reach 30% by the year 2022. This is not only important to increase exports, creating qualified jobs and bringing in dollars, but also to import less, saving money.

In this context the Triple Helix [2] has assisted in reaching the balance between scientific results (i.e. papers, thesis) and the technological products generated by industries, especially the ones based on new technologies. To foster these actions, the unique methodology presented in this paper was designed in order to articulate competencies and investments by gathering together the most important players in this process. The methodology is entitled SIMI [3], an acronym (in Portuguese) for Innovation Network of Minas Gerais which, in turn, is the practical process of implementing the Triple Helix methodology - see figure 1.

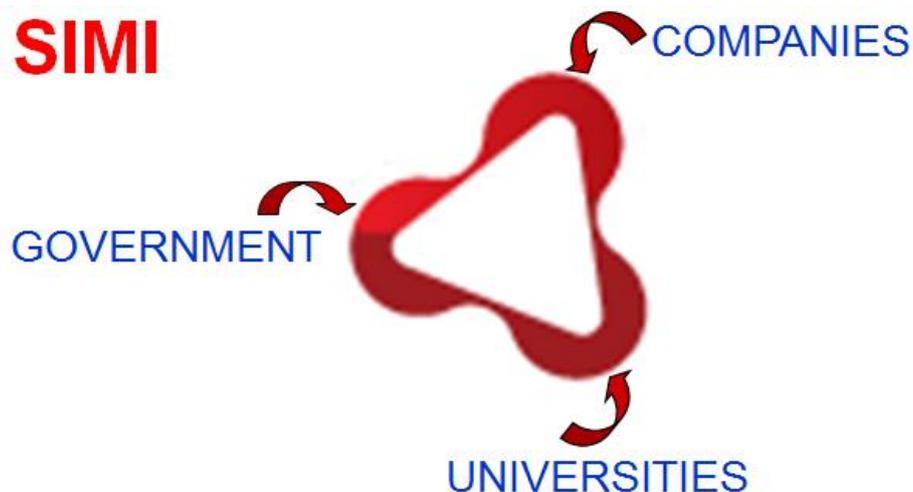


Figure 1: SIMI - A Triple Helix Model

Launched in 2007, by the State Government of Minas Gerais, SIMI has been working on the promotion of innovation and entrepreneurship, using motivation actions and the articulation of the Triple Helix players (researchers, companies and government) with the objective of contributing to the economic complexity and diversification of the State. This Innovation Network has the mission of creating an environment favourable to innovation by promoting interactions and by aligning demand, technological supply and financial resources. SIMI also has an operational platform responsible for preparing and approving policies and strategies encouraging innovation; renewing the culture in favour of innovation in economic and social sectors; disclosing new knowledge and supplying an opportunity of interactivity between the interested players in the State of Minas Gerais.

One of the strategies used by SIMI is the website (www.simi.org.br), a social network which promotes contact among researchers, businessmen, members of the government and the community in a simple and interactive manner, enabling the exchange of information and the prospection of new partners for technology transfer. The website currently has almost 7,000 members, among researchers, entrepreneurs, policymakers and members of communities, who can create profiles and contact each other with private messages. Companies may publish their technology demands to find researchers that may solve them; and universities may publish their research programs and eventually offer them to companies through partnership and agreements.

While the social network is a virtual environment to bring together those that generate knowledge and technologies and those who need such knowledge and technologies in order to compete in the globalized market, SIMI also promotes “Innovation Meetings” designed to encourage personal contact. Innovation meetings take place using two methods that embrace the exposure of the demands of companies and the disclosure of the technology and knowledge held by universities. In one type of Innovation Meeting, technology of a given

sector and from a specific university is presented to a company or a group of companies interested in R&D and innovation. In a second type of Innovation Meeting, problems and demands are presented by a company to a group of researchers that may be able to solve or develop solutions through a partnership. One example is the annual meeting promoted by SIMI with the state energy company of Minas Gerais - CEMIG - to open discussions and encourage the academic community to answer the company's call for technological research. SIMI operates in close contact with universities in Minas Gerais and is capable of finding researchers to solve technological problems for specific companies. Since 2008, when this methodology was created, 54 meetings have taken place, with the goal of fostering innovation in fields such as agribusiness, automotive industry, information technology and electronics; gathering 2,324 participants from 703 institutions, between universities and companies. In order to improve the economic diversity of the State, with the insertion of new companies, SIMI works on the attraction of R&D centres by finding the best opportunities and conditions for the setting up of such structures in Minas Gerais, receiving support from the government and from the universities.

SIMI also fosters academic entrepreneurship, with programs intended to discover entrepreneurial behaviour in university students. One of them is the Seminar of Innovation of Minas Gerais - SEMINOVE, developed inside the universities of Minas Gerais. The Seminar motivates professionals and experts to talk to students about innovation and entrepreneurship. In addition, SIMI also promotes the Graduate Entrepreneurship Program, a competition among students (masters and doctorates) of several universities that aims to help them experience the practice of engaging new ideas and innovation plans and turning them into reality. The students have contact with companies, businessmen and start-ups for a better understanding of how it would be possible to undertake their own technology. In the latest edition, in 2010, the program received the Best Innovation Entrepreneurship Program Award,

offered by the National Association of Entities Promoting Innovation Entrepreneurship - ANPROTEC.

To mention but a few, recent success cases within SIMI are (i) the first partnership between cellulose company Suzano and the Federal Universities of Lavras and Uberlândia for the development of the re-utilization of wood adhesive; (ii) a partnership between fastener producers Ciser and the Federal University of Minas Gerais for the development of new fasteners using nano compounds to replace current screw models. Other cases include partnerships in the fields of environment, document management and also food preservation technologies. In regards to the attraction of R&D centres, SIMI has helped to bring to Minas Gerais the R&D centres belonging to Embraer (aviation) and Ericsson (electronics and telecommunication) during the last years. Some of these cases are described in full in the following sections.

Open Innovation Initiative

The central idea of open innovation is that companies can and should use external as well as internal knowledge to advance their technology and innovation. By doing that with partners they would share both risk and reward. This is a very creative way of bridging the gap between companies (knowledge applicant) and the research centres (knowledge producers). The theory behind the idea was developed by Henry Chesbrough, a professor at the Centre for Open Innovation at the University of California, Berkeley, in his book *Open Innovation: The new imperative for creating and profiting from technology* [4].

The open innovation hypothesis can go further than just utilizing external sources of innovation, such as academic institutions, and therefore can go as far as a change in the use, management, and employment of intellectual property since it is dealing with new valuable knowledge which has to be shared among the partners. Thus, it is understood as the

systematic encouragement and exploration of a wide range of internal and external sources for innovative opportunities, the integration of this exploration with industry capabilities and resources, and the exploitation of these opportunities through multiple roads.

A successful case of open innovation is presented in this section. It regards the partnership between FAPEMIG and VALE - the second biggest mining company in the world. VALE has itself invested significant amounts of money in research during the last years. The company, however, has found out that it could benefit from the strong network of federal universities and research centres available in the State of Minas Gerais by sharing with FAPEMIG the investments and risks in a call for projects on topics of high specialization which eventually could solve the company's technological problems.

The participation of FAPEMIG, a Public State Agency for research development, brings in the third helix of the process by not only facilitating the interaction between VALE and the universities but also, and more importantly, putting money in the partnership. It is important to stress that Minas Gerais State has 14 public universities - the largest number in Brazil. Moreover, the State has mineral mining as the major component of its economy. Nevertheless the State exports raw material (i.e. iron ore) which, on one hand, is low in value and on the other, results in environmental problems.

In this context, the partnership was built taking into account the major topics that academic knowledge could contribute to solve VALE's technological hurdles. As a result, a specific call for projects was tailor made to face the topics listed by VALE such as: new processes for recovering degraded areas, assessment of biodiversity in mining areas and new technology for generating energy using biofuel, to mention but a few. This call for projects was launched in 2010 and had a very good response with 131 projects submitted. The best 56 projects were selected and, at the moment, they are running based on an investment that reaches US\$ 22 million.

One of the projects has already found an important result which is being protected by requesting a patent on a high-tech process of separating gold from the iron ore. On top of finding innovative technological solutions, both the company and the research centres have benefited from the partnership. On the one hand VALE has increased its research spectrum and saved money. On the other, universities and research centres have trained masters and doctors on an important topic for the country and amplified their laboratories. FAPEMIG learned how to promote interaction and experienced the triple helix procedures and methodology.

The assessment of the process of open innovation as a whole and the partnership in particular has demonstrated the success of this pioneer initiative in Brazil, where an alliance between a big Company and a big State Agency may contribute for the country's development. The result was so positive that new proposals are currently under consideration.

Science and Technology Parks

This section describes the Science and Technology Parks (STPs) Programme, which aims at promoting the innovation and the competitiveness of new companies and research institutions of the State. The programme operates by the strengthening of ventures that are focused on stimulating and managing the flow of knowledge and technologies among researchers, universities, R&D centres and technology companies based in Minas Gerais, as well as with the market. The methodology of SIMI described previously is a way of heading towards a so called “emerging user-centred innovation system” [5].

In this context, three Science and Technology Parks that already started operating have been supported technically and financially by the Minas Gerais State Government [6]. All of them are located near or inside the campus of Federal Universities and have support of these Universities and local municipalities.

The Technology Park of Belo Horizonte – BH-TEC is located in the capital city of the State of Minas Gerais and focuses on the development of businesses in the fields of Nanotechnology, Information Technology (IT), Biotechnology and New Materials from mineral sources. It is supported by the Federal University of Minas Gerais (UFMG), one of the three best Brazilian universities. Launched in May 2012, BH-TEC hosts 16 companies which already are cooperating in innovation projects - see figure 2.

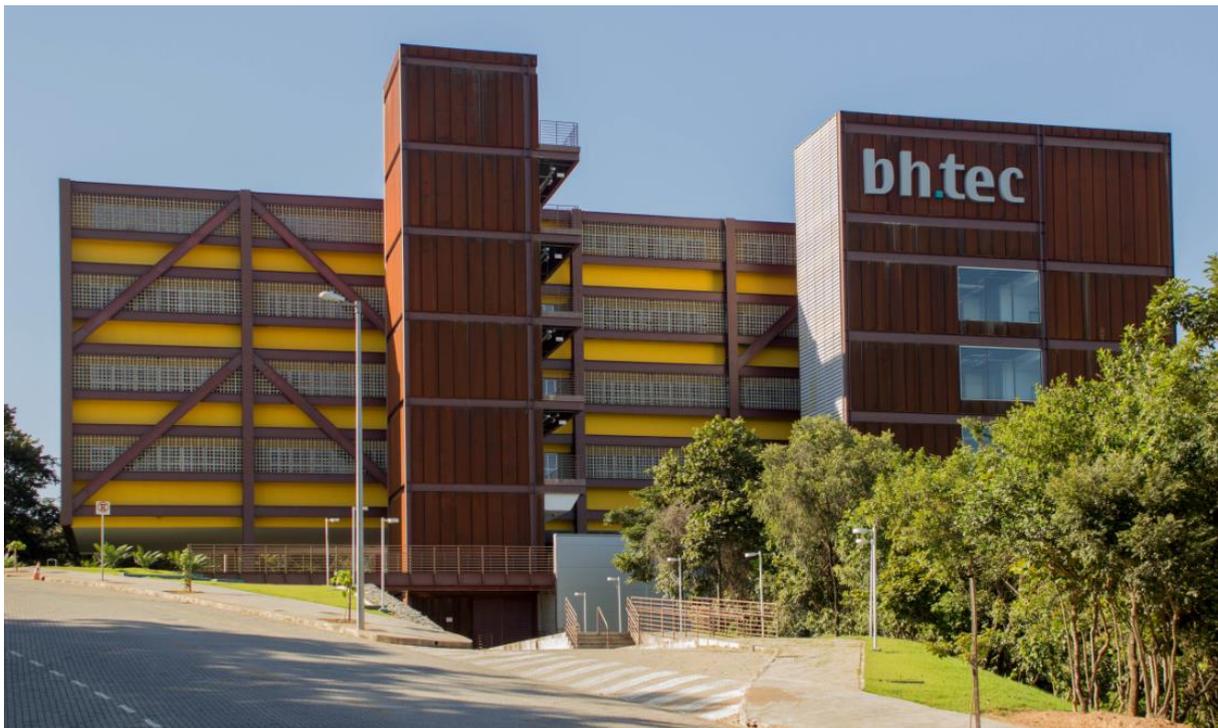


Figure 2: The Science and Technology Park of Belo Horizonte

Located in the town of Viçosa, the Technology Park of Viçosa – tecnoPARQ – has its focus on Agribusiness, IT, Veterinary and Food Technology. It is supported by the Federal University of Viçosa (UFV), which has a long tradition in agricultural research and technology development and transfer to agribusiness - see figure 3. TecnoPARQ started on April 2011 and now hosts six companies and a Business Incubator recognized as one of the best in Brazil by the Brazilian Association of Science Parks and Business Incubators (ANPROTEC).



Figure 3: Science and Technology Park of Viçosa

The third Minas Gerais STP is located in the town of Itajubá - see figure 4. The Science and Technology Park of Itajubá – PCTI focuses mainly in the areas of Engineering, Energy Quality, Energy Saving, Biotechnology, Nanotechnology, IT and Aeronautics. Supported by the Federal University of Itajubá (UNIFEI), PCTI counts with seven companies which are hosted in the Park and a Business Incubator with 20 companies.



Figure 4: Science and Technology Park of Itajubá

Two new parks are under construction, at a very early stage, in the cities of Juiz de Fora (supported by the Federal University of Juiz de Fora with focus on Engineering, Dairy Products and Pre-salt oil reserves exploration) and Lavras (supported by the Federal University of Lavras, focused on Animal Health, Food Technology, Biotechnology, IT and Environmental Management). The Science and Technology Park of Uberaba will receive State Government support for urbanization projects during 2013 and there are STPs feasibility studies to be supported by the State Government for the cities of Diamantina, Montes Claros and Teófilo Otoni and also for the Minas Gerais region of Alto Paraopeba.

Since 2003, the State Government, by means of FAPEMIG's budget, has invested - alone - more than US\$ 30 million in these three Parks – which for Brazilian standards is a considerable amount of money.

Research and Development Centres

The third initiative described in this paper relates to the mechanism for attracting high-tech companies to set up their research and development centres in Minas Gerais. The case of Ericsson is described in this section and the process of conceiving and building the partnership, which takes into account the Triple Helix methodology, is explained.

Ericsson, the Sweden ICT (information and communication technology) company, is a world-leading provider of telecommunications equipment and services to mobile and fixed network operators. Over 1,000 networks in more than 180 countries use their network equipment, and more than 40% of the world's mobile traffic passes through Ericsson networks. It is one of the few companies worldwide that can offer end-to-end solutions for all major mobile communication standards. Ericsson networks, telecom services and multimedia solutions make it easier for people, across the world, to communicate. And as communication changes our way of life and how we work, Ericsson is playing a key role in this evolution.

Using innovation to empower people, business and society, Ericsson is working towards the Networked Society [7], in which everything that can benefit from a connection will have one.

In the so called Networked Society, connectivity will be the starting point for new ways of innovating, collaborating and socializing. This implies freedom, empowerment, and opportunity for the Networked Society and it will bring significant economic, social and environmental benefits to people. It is about transforming companies by disrupting established business models and by creating new job opportunities. With that in mind, Ericsson has decided to set up R&D centres abroad and has chosen Brazil as an ideal location.

Minas Gerais State decided to attract this R&D centre by offering not only the highly qualified professionals formed in the top Federal Universities (already mentioned) but also by sharing the investments required fifty-fifty. This investment is being made by FAPEMIG. The Triple Helix has come in by putting together Ericsson and two Minas Gerais State research institutions: INATEL (a private higher education institute focused on electronics) and FITEC (a private scientific and technological institution focused on ICT).

Together with INATEL, Ericsson is developing the IP Multimedia Subsystem (IMS) technology for mobile telecommunication. Being one of the world's most experienced IMS companies, Ericsson is focussing on the projects involving rapid transformation of large networks aiming at shortening implementation time, reducing risks and developing best-practices. With FITEC, Ericsson is working on Internet Protocol Television (IPTV) to provide more than just TV over IP. The idea is to evolve into an interactive, personalized application framework for creating multi-media-centric applications that can be used and controlled from several devices and easily integrated with other services. To achieve this goal, future-proof IPTV solutions are needed that support media transport over managed networks and the public internet; fixed-mobile convergence; integration with communication services and integration with home networks and associated devices

The success of this experience has proved that the State Policy is working properly and the results have promoted better jobs and generated wealth. The two R&D Centres are being implemented and have an initial budget of US\$ 10 million.

Conclusion

This paper demonstrated how the State of Minas Gerais, in Brazil, is investing in Science, Technology and Innovation by means of using the Triple Helix methodology specially designed to its current context. Three effective examples of success in the areas of open innovation, science and technology parks and attraction of research centres led to a conclusion that the approach used plays a crucial role in this context and, therefore, they should be supported and enhanced. This implies that the State Government together with academia and industries should foster the approach proposed in this paper as a good way of improving competitiveness and generating wealthy. More resources should be allocated to this area at both governmental and private levels to allow for improvements of the methodology and to embrace more initiatives. The universities and industries are advised to join this initiative and to focus on transforming scientific knowledge, currently well developed, into innovative and high tech products. It is argued that SIMI is a suitable framework to establish and to promote the articulation required, among the players, in order to achieve sustainable economical and social growth.

The Brazilian and State governments should try to benefit from the current scenario and be encouraged to provide resources for investing significantly in the deepening of this approach. SIMI is capable of facing the new challenges posed by a competitive world and is an appropriate and well-conceived network to promote advances in science, technology and innovation. The above recommendations and suggestions are made from the standpoint that only by putting Triple Helix theory into practice will it prove itself to be worthwhile for the

State of Minas Gerais and for the country at large. This is the way that Minas Gerais has chosen to advance strategically - supported by science, technology and innovation.

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