XXV IASP World Conference 2008

The Brazilian Army's Technology-Based Business Incubator: Innovation for the National Defense Industry

Parallel Session 7:
Incubators: what are the new developments in the incubation industry?

Author:
Lucia Feijó Barroso (luciafeijo@gmail.com)

Co-Authors:
General Ubiratan Athayde Marcondes and Liutenent Fernanda Vilela Ferreira

Instituto de Fomento e Inovação Exército Brasileiro – IFIEX
Fortaleza de São João – PIRF – URCA – Rio de Janeiro – CEP: 22.291-090 – Brasil

The Brazilian Army´s Technology Based Business Incubator: Innovation for the National Defense Industry

Executive Summary

The Brazilian Army, fulfilling its constitutional mission of defense of national sovereignty, seeks to be a deterrence vector. For the Brazilian Army, dissuasion is the foremost strategy, in which science, technology and innovation play a major role. Based on this, the Brazilian Army's Science and Technology System underwent a recent broad process of restructuring, following a growing strategic prioritization of the area of Science and Technology in Brazil. Considering its mission of stimulating, supporting and enabling technology and management for entrepreneurial initiatives in its scientific and technologic system, the Brazilian Army started its business incubator: Brazilian Army's Techonology-Based Business Incubator, or IETEx (acronym in Portuguese). IETEx provides businesses incubated an infrastructure that goes beyond physical space, equipment, computers and Internet access. It provides access to laboratories, cooperation in projects, training and different kinds of support. This paper aims at presenting IETEx, which, however recent, has already proved to be a key-element in the Brazilian Army's strategy to incorporate the culture and the mechanisms for technology innovation into its Science and Technology System.

Keywords: Brazilian Army, Innovation, Techonology-Based Business Incubator, Science and Technology System.

1. Introduction

In an increasingly competitive world scenario, technological innovation is a very important pre-requisite for the performance of productive units, by adding value to products and going beyond research and development activities conducted by governments and companies. Technological innovation depends on a wide range of issues, like government support and university-industry interaction.

Nations with higher levels of development are those that invest continuously and systematically in science and technology, which enables them to take this effort of innovation into their production environments. Thus, science and technology and their ability to generate innovation are, currently, in the core of policies and governmental strategies. They are the central elements of national power, not only in the political and economical fields, but also in the military field.

2. Panorama of Technological Innovation in Brazil

The discussion on innovation and technological innovation systems is relatively recent in Brazil. The urgent need for the insertion of Brazil in the competitive international scenario has instigated the debate about Brazil's economic development, particularly regarding innovative activities in Brazil, from the understanding that technological innovations offered by national innovation systems play the role of viable economic support of companies and countries.

The performance of innovation systems in contemporary economies is strongly associated with the interactions among the different actors involved in the generation and dissemination of new knowledge and new technologies[1]. The effectiveness and intensity of the science-industry relationship has been increasing in importance.

Although the rise of the development of technology is in the company, while the place of science and education is at the university[2] , Brazil has a feature that can not be overlooked when it comes to innovative activity: about 80% of Brazilian researchers work in research institutions, unlike more mature systems of innovation, in which the majority of researchers work directly in the productive sector, generating innovation. Data from the Brazilian Institute of Geography and Statistics (IBGE) show that, in 2002, less than 30,000 scientists were working in companies, while in Korea this number was 94,000 and in the United States nearly 800,000.
Several reasons explain this disparity, but the most important here is its very existence, which causes imbalances and severe consequences to the activities of innovation. To bring the activities of R&D into the companies that operate in Brazil is one of the main challenges for the industrial development of the country at the moment.

Some initiatives have been taken in recent years to resolve or at least to alleviate this imbalance. The legal framework of innovative activity in Brazil is moving forward rapidly in recent years, which may be exemplified by the regulations of the Innovation Law and the Positive Law. The Innovation Law encourages the participation of scientific and technological institutions in the

[1] **Gusmão, Regina. 2002**. Práticas e Políticas Internacionais de Colaboração Ciência-Indústria. *Revista Brasileira de Inovação*. vol.1.2:327-360.
[2] **Cruz, Carlos H. 2004**. Pensamento Brasileiro sobre Defesa e Segurança. *Ciência e Tecnologia e a Soberania Nacional*. Brasil: Ministério da Defesa.

innovation process, and the Positive Law deals with tax incentives to companies that invest in technological innovation.
The recent implementation of new financial instruments, more suitable to the reality business, as the mechanism of economic subsidy and tax incentives, are steps that contribute to meet the demands of businesses which have innovation as a factor of competitiveness. The realization that economic development is the result of combined efforts between the public and the private sector is moving forward in Brazil.

Brazil has undergone a transition from a top-down national system of innovation to a triple-helix model, with the university playing an expanded role. Academic research groups have arisen as quasi-firms[3] composed of scientists, creating and combining several heterogeneous resources — conceptual, materials, economics and human, acting like entrepreneurs (Law, 1989). A broader set of networks have been created from the university to industry and government, creatively reinterpreting the incubator model to meet various needs for new organizations in Brazilian society[4].

2.1 Technology Based Business Incubator in Brazil

One of the tasks of the National Innovation System is the industrial promotion, which has as one of its aspects the incubation of companies. The businesses incubator mechanism is an instrument of public policy in support of micro, small and medium sized (SME) technology-based companies, in order to make them productive. One of the assumptions is that micro and small businesses are important vectors of technological development. In other words, they can generate technologies that can reach production lines or be handed over to larger companies. Furthermore, SME are in need of specific policies to support and have a key role in reducing regional inequality, with visible impacts on the economic and social development of Brazil. According to the Brazilian Institute of Geography and Statistics, the micro and small enterprises account for more than 90% of the Brazilian industrial organizations and by less than 15% of industrial production.

Incubators started to appear in Brazil towards the end of the 1980s and the original concept arose within a context of changes in policy direction for Brazilian science and technology. They were considered a useful mechanism, or organizational format, for bringing about the greater participation from the universities in the country's socio-economic development, particularly by establishing closer links among the academic world, the industry and the government. The incubators operating in Brazil cover a wealth of different types, including Technology-Based Incubators, Traditional Incubators, Mixed Incubators, Cooperative Incubators and Private Incubators[5].

The key objectives of Brazilian incubators are economic development, employment generation and technology commercialization[6].

---

[3] **Etzkowitz, H. 2003**. Research groups as 'quasi-firms': the invention of the entrepreneurial university. *Research Policy* 32:109–121.
[4] **Etzkowitz, Henry, José M. C. de Mello and Mariza Almeida. 2005.** Towards "meta-innovation" in Brazil: The evolution of the incubator and the emergence of a triple helix. *Research Policy* 34: 411–424.
[5] **Almeida, M. 2005.** The evolution of the incubator movement in Brazil. *International. Journal of Technology and Globalization*, 1(2), 258-277.
[6] **Lalkaka, R. and D. Shaffer. 1999.** Nurturing Entrepreneurs, Creating Enterprises: Technology Business Incubation in Brazil. *International Conference on Effective Business Development Services.* Rio de Janeiro, Brazil.

The Brazilian incubator movement represents a new direction in Latin American science, technology and industrial policy. There is a shift from central government, whence policy has traditionally emanated, to multiple sources of initiative. The absence of a centralized project allowed for considerable flexibility in the application of the incubator concept to activities with different goals. The incubator allowed Brazil to create a less expensive development model, taking advantage of the existing academic, industrial and government resources. Bottom-up initiatives from universities and municipal governments converged with lateral ones from industry groups, regional associations and state governments, as well as top-down programs from national government. An immanent innovation policy was created out of the sum of these initiatives from different sources.

Brazil occupies an important position in the world ranking of company incubation, both by the number of incubators and incubated companies and the annual rates of growth, being leader in South America and the South Hemisphere.

According to the Panorama of Business Incubators and Technological Parks, research conducted annually by the National Association of Entrepreneurial Ventures Promoting Entities (ANPROTEC), which aims at portraying and documenting the situation of the movement of Brazilian incubation, there are currently 400 incubators in Brazil, of which 40% are incubators of technology-based companies and nearly 60% have less than five years. Although more concentrated in the South and Southeast, the most developed regions in Brazil, they are now in all regions of the country.

Brazilian incubators receive support from a broad spectrum of federal agencies, such as FINEP (Brazil's Innovation Agency), public-private entities like SEBRAE (Brazilian Micro and Small Enterprise Support Agency), strong national incubator associations, such as ANPROTEC, as well as local, state and city governments. Corporations, such as Petrobras and Biobras, support incubators related to their technology cluster. The interaction between government, universities and industry appears to be synergistic and relatively well-coordinated with incubator industry associations, playing a boundary spanning role.

3. Panorama of Technological Innovation in Brazilian Army

The Brazilian Army, fulfilling its constitutional mission of defense of national sovereignty, seeks to be a deterrence vector. A deterrent country is one that has an integrated set of possibilities – social, political, economic and military – that provides it with the ability to ensure the security of its territory without calling for the last resource: a direct military employment. For the Brazilian Army, dissuasion is the foremost strategy, in which science, technology and innovation play a major role.

One of the important features of many technologies developed specifically to answer military needs is its application in goods and services of civilian use, with obvious benefits to society. Historically, the military technological innovations around the world have been generated by basic and applied scientific research, which produce knowledge that can be applied in experimental developments with civil employment. This dual intersection has been impelling civil-military projects which, from its origin, have double purpose and foster the capacitation of resources which are not specifically destined to the foment of military R&D[7].

[7] **Cardoso, Alberto M. 2004**. O papel da Ciência e Tecnologia na Defesa da Soberania Nacional. *Ciência e Tecnologia e a Soberania Nacional*. Brasil: Ministério da Defesa.

Due to the high financial cost of R&D, to the need of return on invested capital, and to the huge power potential carried by innovative technologies, countries and companies which dominate them will not share. Therefore, it is important for any nation that wishes to defend its national sovereignty to create a vigorous mentality of S&T that does not leave any room for the dichotomy of rhetoric versus practice.

The area of Science, Technology and Innovation requires heavy investments, but its resources are much too inferior to its demands. A strong effort is necessary in order to reduce the existing technological gap in Brazil and in the South-American community[8].

3.1 Brazilian Army's Science and Technology System - SCTEx

The Brazilian Army's Science and Technology System underwent a recent broad process of restructuring, following a growing strategic prioritization of the area of Science and Technology in Brazil. The main results of this process of restructuring are shown in several indicators, such as: a gradual improvement of the planning and management process of science and technology, an increasing intra-institutional relationship, and increasing budgetary resources allocated to the activities of science and technology.

In this new format, SCTEx has innovation as the way to reach its objectives. These can be understood by its mission and vision:

Mission: Plan, implement, monitor and improve the macroprocesses of Brazilian Army's Science and Technology, its programs and projects and foster the National of Defense.

Vision: Reach through innovations, products and services, a scientific-technological capability that allows Brazilian Army to contribute to the deterrent power of the country.

Among its several objectives, SCTEx has the following as primary:

- Contribute to the promotion of the National Defense Industry;
- Master technologies that ensure strategic and operational advantages, by prioritizing the ones of denied access;
- Develop projects for R & D of materials and systems of interest to the Army;
- Produce materials of military use (MEMs), and other materials and systems of interest to the Army;
- Improve the operational and technical evaluations of MEMs and products controlled by the Army;
- Provide updated geographic information, prioritizing the Amazon and other border regions;
- Improve infrastructure for R & D, evaluation, production and information;
- Produce intelligence technology; and
- Deploy a model of innovation management.

As a consequence of SCTEx restructuring, a central office for the Brazilian Army's System of Science and Technology (SCTEx) has been created: the Brazilian Army's Department of Science

[8] **Silveira, Rui M. 2004.** Reflexões sobre Defesa e Segurança: uma Estratégia para o Brasil. Pensamento Brasileiro sobre Defesa e Segurança. . *Ciência e Tecnologia e a Soberania Nacional*. Brasil: Ministério da Defesa.

and Technology (DCT), from the merger of the Secretariat of Science and Technology and the Secretariat of Information Technology.

3.1.1 The Department of Science and Technology – DCT

The Department of Science and Technology of the Army presents an organizational model that brings together a functional structure and a matrix structure. The organizational structure is the model adopted by DCT for the management of macroprocesses of SCTEx. Its functional structure is composed by eight directly subject Military Organizations. The ones described below are those which are more related to the innovation process.

- **Military Institute of Engineering – IME:** it is a military organization of the Brazilian Army that is, at the same time, an engineering and officer training school. It offers undergraduate and graduate courses for military and non-military engineers, and conducts basic research of interest to the Army. Recognized by its pioneering and excellence, IME reached the 1st place in seven engineering specialties and 2nd place in one in the last National Examination Performance of Students (ENADE). This examination is conducted by Ministry of Education and aims at verifying the performance of students of undergraduate courses in relation to programmatic content, skills and competencies.
  In the innovation process of the Army, IME gives academic support and supplements entrepreneurship.

- **Technological Center of the Army – CTEx:** is the body of support of the Department of Science and Technology. It supervises and implements technological research, experimental development, as well as the standardization of Materials for Military Use (MEM).

- **Executive Manufacturing – DF:** is the regulatory body of technical support that supervises the activities related to manufacture, adjustment, transformation, modernization and nationalization of the material for military employment.

- **Center of Evaluation of the Army – CAEx:** its mission is to plan, guide, coordinate, manage and implement the technical and operational evaluation Materials for Military Use (MEM), evaluating the influences of its operational performance in doctrine, personnel and logistics.

- **Executive Geographic Service – DSG:** responsible for supervising the issues related to cartography and developing of Geographic Information Systems. The DSG has been participating in the mapping of the country for more than a century, as one of the cartographic bodies of the Federal Government, responsible for systematic mapping land in the scales of 1:250.000 and larger.

- **Center for System Development – CDS:** is responsible for the design, development and deployment of systems projects of interest of the Army in the area of Information Technology.

- **Center for Integrated Electronic War – CIGE:** its mission is the formation of human resources in the systems of Electronic War. In order to reach its goals, it employs tactical education, maintenance, supply and administration.

3.1.2. Basic Plan of Science and Technology – PBCT

The Basic Plan for Science and Technology – PBCT, embodies the developed strategies and planned actions for the fulfillment of the mission and the achievement of goals of SCTEx, by predicting the use of human resources and financial management to promote effectiveness, efficiency and modernization of SCTEx.

The PBCT makes the general alignment of the bodies of the Department of Science and Technology, that goes from basic research at the Institute of Military Engineering – IME, through applied research, to the manufacture of prototypes.
Among the guidelines of the strategic PBCT is the emphasis on innovation, which led to the creation of the Technology-Based Business Incubator of the Army, which incubates companies related to the projects of interest to the SCTEx.

4. The Brazilian Army's Technology-Based Business Incubator

Considering its mission of stimulating, supporting and enabling technology and management for entrepreneurial initiatives in its scientific and technologic system, the Brazilian Army started its business incubator, Brazilian Army's technology-based business incubator, or IETEx (acronym in Portuguese). In this pioneer initiative, the Brazilian Army received the support of several public and private institutions, particularly PETROBRAS, that finances the infrastructure remodeling. The Brazilian Army's technology-based business incubator provides businesses incubated an infrastructure that goes beyond physical space, equipment, computers and Internet access. It provides access to laboratories, cooperation in projects, training and different kinds of support.

IETEx is located in Rio de Janeiro, inside "Fortaleza de São João", by the Sugar Loaf, and has the advantage of being located near the Military Institute of Engineering, the military organization responsible for the training of higher level personnel for the Brazilian Army's science and technology field. IME is recognized, in Brazil and abroad, as a center of excellence in the teaching of engineering. The location of IETEx in Rio de Janeiro joins a recognized military training school in the scientific-technological area, represented by IME, to the potential of this city to become a center of science and technology. These are privileged conditions for the establishment and development of high-technology.

IETEx has launched its first edict in 2006. So far, IETEx has incubated two companies and two projects of Army's interest.

Technology in Command and Control Systems – TecC2 – works in the area of Information Technology (IT)

services, development, implementation and maintenance system. The main differential is the company's use of advanced technology, now available or under development in the academic, to provide integrated solutions to optimize processes involving the need to make decisions and monitor their execution based on a complex set of updated and accurate information.
The embryo is the Command and Control Laboratory of IME (LabC2/IME), which provides teachers and undergraduate and graduate students of IME and has as its main objective the development of research and projects related to Command and Control Systems and, at its dual civil, Decision Support Systems.

Inspectronics – is a technology-based company founded by researchers from the Polytechnic School of the University of São Paulo, after years of study of technical, economic and market aspects. From the design of a "Robotized System for In-Pipe Inspection", supported by FAPESP (São Paulo State Foundation for Research Support), Inspectronics developed prototypes of robots that move inside pipes and ducts and are able to conduct visual inspections trough an ultrasound scanning equipment.
In partnership with IME, Inspectronics adopted at the FINEP/ CT-PETRO the project of developing robots to inspect hulls of FPSO'S (Floating Production Storage & Offloading - ship platforms for the production and storage of oil) in operation.

In pre-incubation stage, IETEx hosts two relevant projects supported by FINEP and executed by IME:

-- SISGED - which aims at developing a national prototype of a system capable of estimating trajectories of products, in partnership with PETROBRAS and the Technology Center in Ducts (CTDUT);

-- SIRIS project - Robotized System for Inspection of Foreign Risers, that are tubular elements which connect the head of the oil well to the platform or boat floating on the surface of the sea.

Though independent, SISGED and SIRIS projects are interconnected by the insertion in the same context and share part of the teams and facilities offered by IETEx.

In 2007, there was another selection process of new enterprises to IETEx. As a result, four other enterprises were incubated, all working in areas of Army's interest.
IETEx participates with four other incubators (COPPE/UFRJ; the National Institute of Metrology, Standards and Industrial Quality; and the National Institute of Technology and National Laboratory of Computer Science) from the "Technology and Innovation Consortium of Rio de Janeiro: More and Better Businesses", supported by FINEP. In a pragmatic way, the project takes care of research opportunities of technology business for the institutions involved.

IETEx is developing several other projects, the most important of which is what is being done with the Technology Business Incubator Santos Dumont, in cooperation with the Department of Science and Technology Foundation and the Technological Park Itaipu Brazil – PTI, in which both participate as "Sister Incubators", both developing projects in common.

PTI and DCT signed a term of cooperation in the technical and scientific area, providing for joint actions in the areas of education, research and development in information technology, safety of dams and geoprocessing.

Among the actions presented in the work plan is the implementation and operation of the system of command and control of civil defense in the city of Foz do Iguaçu, where the company is located. The system, developed by the Military Institute of Engineering, is part of the National System of Civil Defense, at the Ministry of National Integration.

5. Institute of Development and Innovation of the Brazilian Army - IFIEX

Amidst the process of implementation of IETEx, the Institute of Development and Innovation of Brazilian Army – IFIEX has also been set up in order to support the actions of promotion in the Army. This Institute, like a foundation, civil associative entity, with legal personality of private, nonprofit, aims at attracting resources, management and support to actions of Technology-Based Business Incubator.

In its Statute, Article 5 : *"The IFIEX aims at encouraging, supporting, stimulating and implementing activities of research, scientific promotion, technological, and financial development and those related to innovation to support the Brazilian Army in the areas it considers relevant to be stimulated"* .

Institution responsible for managing IETEx through an agreement signed with the Army, the IFIEX has among its main objectives the following:

- Stimulate and strengthen initiatives in the field of science and technology to support the Brazilian Army in the search for solutions in order to enable it to achieve the goals set out in its Basic Plan for Science and Technology - PBCT;
- Support the creation and consolidation of excellence enterprises in the technological area, encouraging the processing of results of academic researches conducted in educational institutions, research and development of the Brazilian Army in new business and projects, particularly through support to the activities of the Technology-Based Business Incubator of the Brazilian Army;
- Provide infrastructure to support the growth of innovative projects;
- Execute projects for research, development and promotion of science and technology in areas and activities of interest of the Brazilian Army;
- Support businesses for the products and/or processes arising from the technology research so that they can reach the market efficiently, providing favorable conditions for entrepreneurs for accelerated and healthy business development;
- Collaborate with the modernization of the Brazilian industrial park, using human resources and the technological potential available in the various military organizations of the Brazilian Army;
- Promote, organize and manage courses, events, training and programs for capacitation and dissemination of knowledge in the technologies of interest and in areas related to the activities of research and development of the Brazilian Army in the areas of entrepreneurship and business skills;
- Establish relationship between the society and the activities of science and technology developed in educational, research and development establishments of the Brazilian

Army, identifying, developing and supporting initiatives that connect these actors, in order to implement projects of interest of the Brazilian Army;
- Support the management of intellectual property generated within the Brazilian Army, seeking opportunities for licensing and partnerships with businesses, which reverse in the stimulation of the activities of research and development;
- Support the adoption of a program for transfer and trade of technology for the Brazilian Army, establishing an office for managing technological skills, learning and innovation;
- Promote and support researches, studies and projects in areas of scientific and technological interests for defense and national security; and
- Contribute to all initiatives to strengthen the national innovation system.

Besides the incubation of companies and projects cited, IFIEX, the manager institution of the Incubator, is developing a project that aims at the stimulation of entrepreneurship and innovation culture at Military Institute of Engineering, through specific courses in which students may participate in the development of projects that are part of the curriculum of the courses offered at the Institute.

This tripod – Department of Science and Technology, Technology-Based Business Incubator of Army and Institute of Development and Innovation of Brazilian Army – is responsible for the direction given to the activities of the incubation of companies in the Army, and supports the other activities to promote industrial to a minimum basis of the Industry of Defense that Brazil needs to have.

6. Conclusion

The initiative to deploy a Brazilian Army's technology-based business incubator holds particular importance to encourage the provision of new technology for the Brazilian Armed Forces, as well as for the civilian market. The costs and risks involved in the generation of technological innovations in the area of defense and security is relatively high, so the IETEx has partnerships with major Brazilian institutions interested in the prospects for social and economic development that this venture allows glimpse.
The Brazilian Army's Technology-Based Business Incubator, although recent, has already proved to be a key-element in the Brazilian Army's strategy to incorporate the culture and the mechanisms for technology innovation into its Science and Technology System. Through development of new models of incubation, IETEx aims at promoting the field of new technologies, contributing to the strengthening of the industrial base of defense and to the national development and, consequently, increasing the deterrent capacity of Brazil.

References

Almeida, M. 2005. The evolution of the incubator movement in Brazil. *International. Journal of Technology and Globalization*, 1(2), 258-277.

ANPROTEC. 2006. Panorama Nacional Anprotec 2006. Web: http://www.anprotec.org.br. **National Association of Entrepreneurial Ventures Promoting Entities.**

Cardoso, Alberto M. 2004. O papel da Ciência e Tecnologia na Defesa da Soberania Nacional. *Ciência e Tecnologia e a Soberania Nacional*. Brasil: Ministério da Defesa.

Cruz, Carlos H. 2004. Pensamento Brasileiro sobre Defesa e Segurança. *Ciência e Tecnologia e a Soberania Nacional*. Brasil: Ministério da Defesa.

Etzkowitz, H. 2003. Research groups as 'quasi-firms': the invention of the entrepreneurial university. *Research Policy* 32:109–121.

Etzkowitz, Henry, José M. C. de Mello and Mariza Almeida. 2005. Towards "meta-innovation" in Brazil: The evolution of the incubator and the emergence of a triple helix. *Research Policy* 34: 411–424.

EXÉRCITO BRASILEIRO. Plano Básico de Ciência e Tecnologia - 2007-2010. Brazil.

_____. Plano Básico de Ciência e Tecnologia - 2008 – 2011. Brazil.

_____. 2006. Diretriz para a Implantação e o Funcionamento da Incubadora de Empresas de Base Tecnológica do Exército. Brasília, DF, Brazil.

FINEP. 2006. Brasil Inovador – O Desafio Empreendedor – 40 histórias de sucesso de empresas que investem em inovação. Web: http://www.finep.gov.br. **Brazil's Innovation Agency.**

Gusmão, Regina. 2002. Práticas e Políticas Internacionais de Colaboração Ciência-Indústria. *Revista Brasileira de Inovação*. vol.1.2:327-360.

Lalkaka, R. and D. Shaffer. 1999. Nurturing Entrepreneurs, Creating Enterprises: Technology Business Incubation in Brazil. *International Conference on Effective Business Development Services*. Rio de Janeiro, Brazil.

Law, J. 1989. Le Laboratoire et ses réseaux. In: M. Callon, Editor, *La Science et ses Réseaux*, La Decouverte, Paris.

Medeiros, Rodrigo. 2007. Inovações Tecnológicas e o processo de desenvolvimento econômico. Análise, 18:51-63. Porto Alegre, Brazil.

MINISTÉRIO DA DEFESA. 2002. Seminário Política de Defesa para o Século XXI. Brasília, DF, Brazil.

_____. 2003. Concepção Estratégica do Sistema de Ciência, Tecnologia e Inovação para a Defesa. Brasília, DF, Brazil.

_____. 2004. Política de Ciência, Tecnologia e Inovação (C, T & I) para a Defesa Nacional, Portaria Normativa nº 1.317/MD, de 4 de Novembro de 2004. Brazil.

Silveira, Rui M. 2004. Reflexões sobre Defesa e Segurança: uma Estratégia para o Brasil. Pensamento Brasileiro sobre Defesa e Segurança. . *Ciência e Tecnologia e a Soberania Nacional*. Brasil: Ministério da Defesa.

Weisz, Joel. 2006. Mecanismos de Apoio à Inovação Tecnológica. Brasília: SENAI/SN, Brazil.