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Innovation Management System of Ecuador

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Abstract

This paper shows and describes the dawn of the innovation management national system in Ecuador and presents the public policies and financial movements made for improve such system. Furthermore, it exhibits a proposal model for the relation and interaction between the participant institutions from de private and public sector in order to follow a triple helix model.

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Keywords: Innovation system; Ecuador; public policies; triple helix model

1. Introduction

Nowadays, the knowledge society that is being built demands studies and analysis about the dimension and the effect of investments in the companies' innovation management, this may give them a systematic visualization about their influence in the countries and communities development.

The innovation theory links together the impact from the technological changes and it´s interrelation with governmental and business policies. In the early twentieth century, *Joseph Schumpeter* suggested that economic development is motivated because of innovation that is obtained by a dynamic process whereby new technologies

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replace older, in what he called ¨creative destruction¨ (Ayestaran, 2011). This author recommended a list with five types of innovation:

i. Introduction of new products.
ii. Introduction of new production methods.
iii. Opening of new markets.
iv. Development of new sources of supply of raw materials.
v. Creation of new market structures in an industry.

On having introduced a new product a company places in a profitable position opposite to his competitors because it initiates his curve of learning, development and expansion, before the other actors of the market (Blumentritt & Danis, 2004).

Firms that innovate in the process obtains an increase of the productivity and the company benefits from an advantage in the structure of costs on his competitors and, therefore; an increase in margin of usefulness opposite to the price of market.

On having differentiated his products, the companies open new markets, acceding to new segments and niches with a disagregated demand. Transforming his organizational structure and adapting to new markets, it manages to increase the benefits or to reduce his costs (Zhou, Yim, & Tse, 2005).

The improvement of the capacities of the methods of production generates the possibility of the emergence of new products, as well as to appropriate again knowledge and technologies that will be able to be in use in new innovations.

The technological environment possesses a double mission: to provide technology to the productive sectors, especially to the SME´s (Small and Medium size Enterprises) and to the service companies; and, to facilitate the adoption of the knowledge produced in the scientific environment to the solution of the needs of the industrial sector (Berumen, 2011). Finally, the political and social environment, will allow the generation of systems of incentive for the innovation. In the case of Ecuador, the last public policies tries to make this system available for the whole country in order to achieve a triple helix model (Petrelli & Berumen, 2009).

2. Literature Review And Hypotheses

Abernathy and Utterback (1978) were the first ones in arguing that in order that another sector will be created inside the industry it was necessary to innovate, but for this to be it was also necessary to develop the processes of production. The right system of innovation was looked to obtain better results, influenced by investigations of the scientific institutes or universities, which are financed by government ministries.

The National Innovation Systems (NIS) bear in mind economic factors but they do not leave aside the social, institutional, organizational and political factors. The systems must have a very stable structure to continue working and always giving the principal role to the institutions. One of the principal tools to stimulate the development is the investment in research and development from the government. Porter affirms it establishing,

"The advantage of a nation in an industry is made clear essentially by the stimulus that exercises the nation base in the competitive improvement and innovation" (Porter, 1990). The concept of the NIS includes everything explained previously.

The concept that Edquist and the OECD gives expresses that the NIS are systems constituted by institutions and organizations of a country that influence the development, diffusion and use of innovation.

In the global context there are many countries and also institutions that have developed their own national innovation system. For instance, we have the manual of Oslo in Europe (OECD, 1997) and the manual of Bogota in Latin America. When these systems are checked, we observed that they were made for developed countries that already have a national innovation system. If we get to a more specific context, in the case of Ecuador, many differences can be observed when we analyze these manuals, which are not done to be used in developing countries. Inside this context and with the given examples, the aim of this paper is to be able to suggest a structure for the national innovation system for Ecuador.

3. Methodology

The need of Ecuador to reduce poverty and to possess a major market share in Latin-American and world has directed the government to focus in the investment for the development of the human capital in areas as: knowledge, science, technology and innovation. The recent bet of Ecuador´s national government on having make a decision for a change in the production matrix of the country of happening of being an economy primarily exporter to being an economy based on knowledge and for making processed products. It has come from the hand of the wide investment with public funds that are destined to the creation of universities, institutes and centers of investigation, all by the intention of obtaining results in the development of the human talent, since this one is the fundamental prop of the change of the production matrix of the Ecuador (SENPLADES, 2012).

In 1979, the National System of Science and Technology is created, at the same time there was created the CONACYT (National Advice of Science and Technology). At the end of the 20th century in 1994, the advices and ministries in charge of the research and development of the human talent in the country were restructured. The presidency by means of executive decree (Creamer Guillén, 2007) creates the SENACYT and FUNDACYT granting them the power to be the organisms in charge of the development of the science and technology in the country (Creamer Guillén, 2007).

From the year 1994 until 2006, a model of a National innovation System was developed. It was rudimentary and basic. Several projects were developed, but at the end of each one the weaknesses of the system were seen. One of the major weaknesses was that it did not exist an entity that evaluated the projects to its ending. In addition, the projects were not financed in the best way, only there were destined 0, 25 % of the law of public contracting. Adding that, the majority of projects were not going according to the needs of the country (Creamer Guillén, 2007).

Confusion was generated because people don´t know who were those who were directing the programs. In

2006, the National System of Science, Technology and Innovation (SNCT) was re-formulated. The new system had a fundamental aim; integrate the areas of the public and private sector. The joint work was looked between the universities and institutes specialized in the innovation by the industrial sector and for this the CONACYT (National Council of Science and Technology) was created as an organism adhered to the Presidency of the Republic, to evaluate and direct the actions of the SENACYT (Creamer Guillén, 2007).

The SENACYT was the manager of the investment in the development (research and development), innovation and the strengthening of the projects that were in progress.

A more responsible model was attempted to carry out with the idea that the projects and the investments were evaluated in the best way; this model also had weaknesses (Creamer Guillén, 2007).

The National Government re-threw the program in 2010. By means of Executive Decree N° 15, it designated the Vice-presidency of the republic to realize the follow-up, evaluation and control of the fulfilment of the policies, of the institutional management of the coordinating departments of these areas and of the projects and processes of the same ones. At the same time, the department of development and human talent would be the manager of realizing works in innovation, science and technology, working as a whole with the Vice-presidency to be able to analyse the change of the production matrix of the country.

The secretary of Top Education, Science, Technology and Innovation (SENESCYT) was created as a governing entity of the investment in the projects of research and development of the country. The aim of this new decree is to generate the interaction between the different institutions with the Department of Education, and the Department of Culture and Heritage to generate a source of knowledge that strengthens the economy of the country (Secretariat of Top Education, Science, Technology and Innovation, 2014).

We have made an investigation of the National Innovation Systems models, we can notice that from 1978 up to the date, there is no a specific model who could explain how Ecuador makes the different innovative processes. On having collected the information we observe that the Vice-presidency, Department of Human Talent, Secretariat of Top Education, Science, Technology and Innovation, Department of Culture and Heritage, and the Department of Education are the most important departments that exercise major power in this topic.

Institutes of Scientific Investigation

The Institutes of Scientific Investigation are controlled by the Ecuadoran State, but in turn, are administered by the Coordinating Department of Knowledge and Human Talent, and the National Secretariat of Top Education, Science, Technology and Innovation (SENESCYT). The intentions of the institutions are: to discover sources of renewable energy, to inventory the biodiversity of the country and to raise the indexes of productivity (El Telégrafo, 2012).

The Public Institutes of Investigation of the country shape eleven institutes: National Institute of Meteorology and Hydrology (INAMHI), National Institute of Fishing (INP), Geographical Military Institute, Oceanographic Institute of the Navy (INOCAR), National Institute of Investigations Gerontologists, National

Institute of Investigation Geological Miner Metallurgical (INIGEMM), National Autonomous Institute of Agricultural Investigations (INIAP), National Institute of Cultural Heritage (INPC), National Institute of Energy Efficiency and Renewable Energies (INER), Institute Ecuadorian Antarctic (INAE) and National Institute of Public Health (Fig. 1).

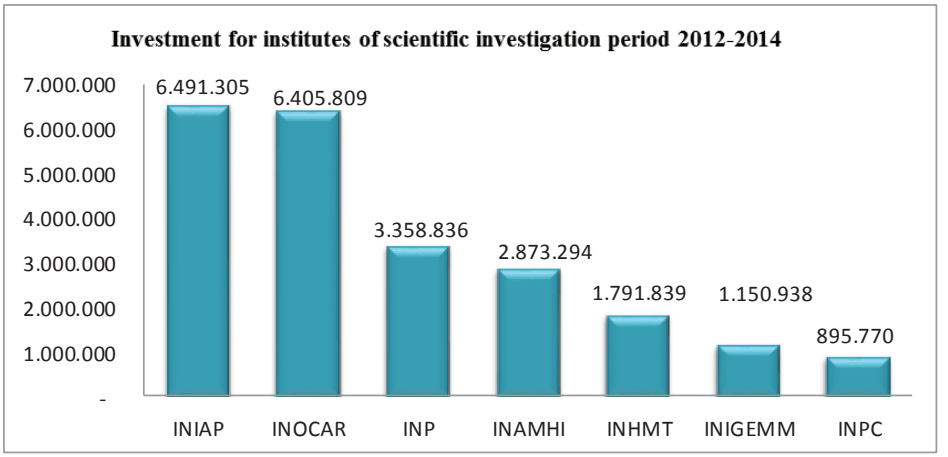

Fig. 1. Investment for institutes of scientific investigation period 2012-2014. Authors: W. E. Figueroa, M.P. Alvarado.

Nowadays, the scientific and technological investigation is financed by more than fifty international available at SENESCYT. This allows that the Ecuadorian investigators send their offers of investigation linked to the science, technology and innovation.

As for the Scientific base of information in 2013 an investment of $5,214,605.55. The institutions entrusted in financing the amount of the investment were the universities participants and the SENESCYT (Subsecretary of Top Education, Science, Technology and Innovation, 2013).

The Government financed a total of 22,967,791 million dollars to seven Public Institutes of Investigation from the year 2012 for 2014 (see Fig. 1). In addition, the government financed 174 projects with a total investment of 81,434,533 in 2012 (Subsecretary of Top Education, Science, Technology and Innovation, 2013).

In the year 2011, the Total Expenditure in Activities of Science, Technology and Innovation was 1,210.53 million dollars. The expense in research and development added as percentage of the GDP in the year 2011, has been 0.35% and 0.40% in activities of science and technology. According to the national survey of Activities of Science, Technology and Innovation (ACTI) of the period 2009-2011.

The money to finance the investigation and the development of the human talent in the Ecuador comes from different sectors. It is possible to observe that the public sector is the one that invests big quantities of money, which does not happen in developed countries, where the private companies are those who invest in innovation. The sources of financing are the following ones: Government, Companies, Top Education, NGO and Foreigner. (See Fig. 2).

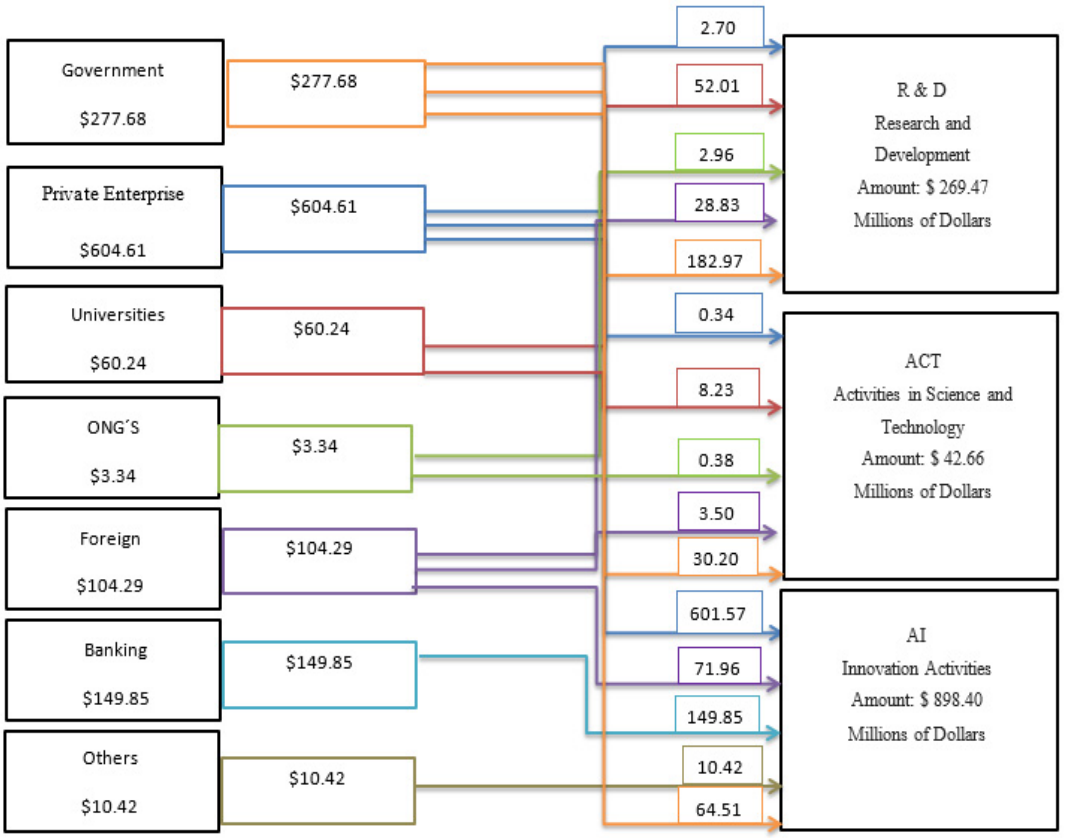

Fig. 2. Flow of financing in the Added Expenditure in Activities of Science, Technology and Innovation year 2011. Authors: M.P. Alvarado, W. E. Figueroa. Source: Survey ACT.

The following graph shows the principal agents and institutions that finance three different activities (Research and development, Activities of Science and Technology and Activities of Innovation) regarding to the innovation and the development of the country. The sources are the following ones: Government, private company, universities, ONG'S, foreigner, banking and others.

The investment that the government does in research and development and activities of innovation is the strongest in comparison with other sectors Ecuador in the last years has been characterized by its great public investment, according to updated numbers (2013) it represents 14% of the GDP (SENPLADES, National Secretariat of planning and development, 2013). Therefore, the government in 2011 (according to survey of the year 2011) invested in research and development near 67.9%. In activities of science and technology it invested 10.83% and in activities of innovation 23.46 % of the total (277.68 $ million).

Private companies spent in total 604.61 $ million in activities of science and technology. Dividing this investment in three activities. Investing 99% of the total amount in activities of innovation (601.57 $ million), Being other activities of minor investment like research and development and ACT, 0.50% and 0.056% respectively.

On the other hand, the universities, a total of 60.24 spent $ million. 86.34 % of the total was destined to the research and development (52 $ million), whereas 8.23 $ million were used for activities of science and technology (ACT) this means 13.66 % of the total amount.

The Non governmental organizations (NGO'S) invested $3.34 million. The expenditure was the following one: 88.76 % (of the total amount) was destined to research and development and 0.38 % to ACT.

Foreign money has been also invested in activities of science and technology. In total, foreign money has contributed with $104.29 million, being the activities of innovation with the major investment (68.90 %). Likewise, 27.75% was invested in RD and 3.35% in ACT. According to the graph banking in Ecuador has invested $149.85 million in activities of innovation, this means, it invested 100 % of the amount to this area.

Implementation results

Analyzing the data for sector, it threw interesting quantities, since the private companies are those who invest more and the government preserves an important position. The companies approximately invest $177.97 million, of which $156.56 are destined to RD and $21.41 to ACT. (Fig. 3 numbers given in millions)

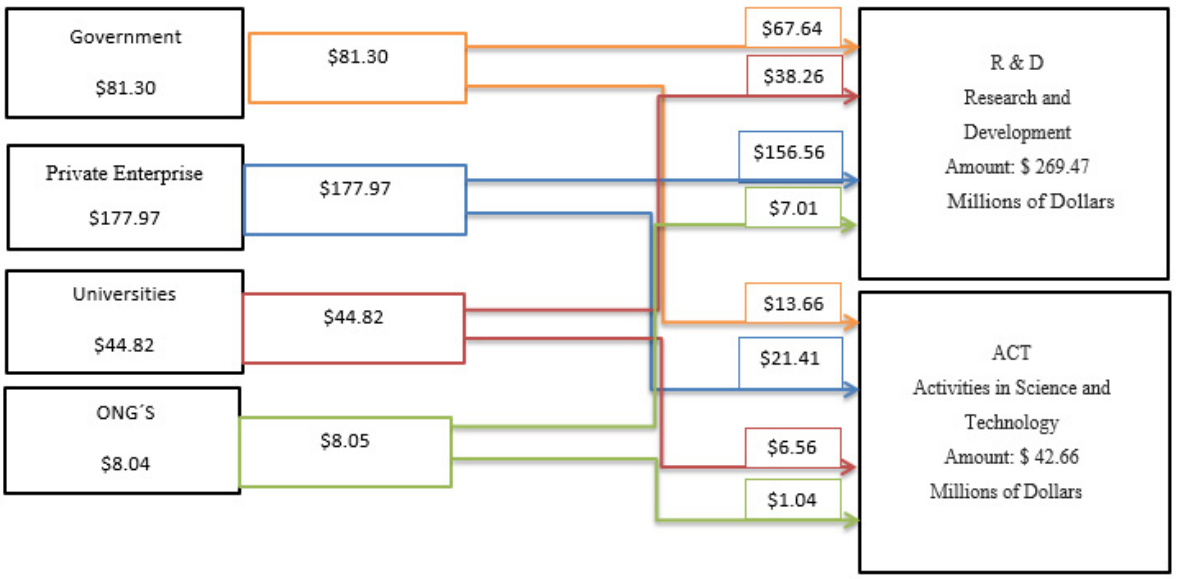

Fig. 3. Flow chart of financing for sector in the Expense Added in Activities of Science, Technology and Innovation (2011). Authors: W. E. Figueroa, M. P. Alvarado Source: Survey ACT.

The government, invest $81.30. Being the field of research and development where there goes the major investment ($67.64). The activities of science and technology $13.66.

The universities and NGO invest $44.82 and $8.05 respectively. Being the field of research and development the one that receives more. The universities invest $38.26 and the NGOs $7. Whereas for activities of science and technology (ACT) the universities spend $6.56 and NGO $1.04.

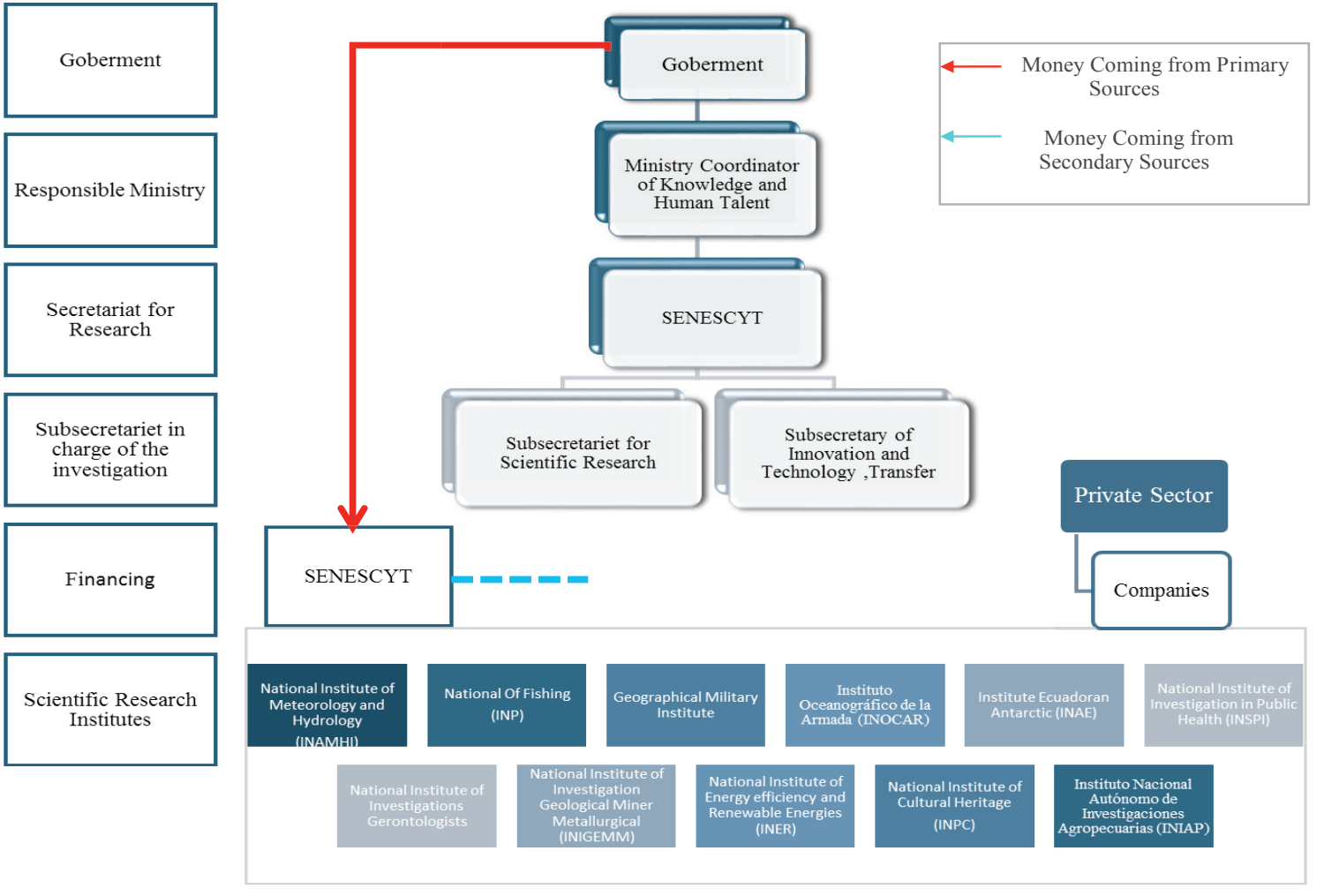

Fig 4. Structure of a possible National Innovation System for Ecuador.

4. Conclusion

The realized studies have taken us to the conclusion that a National System of Innovation (SNI) in the Ecuador still has not been exposed. We have shown different NIS models but none shows effectively the process of innovation (Financing, investigations and results) inside the country.

On the basis of the information collected of the different departments, ministries and institutions who are involved in the development of the country, we proceeded to create a model of how it might be the National System of Innovation inside the Ecuador (See Fig. 4).

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