Technological development of the Western Amazon: financing of research and development projects by the Amazon Informatics Law

Mayana Fernandes Veras (Corresponding author)
Programa de Pós-Graduação em Design, Universidade Federal do Amazonas, Amazonas, Brazil.

Claudete Barbosa Ruschival
Programa de Pós-Graduação em Design, Universidade Federal do Amazonas, Amazonas, Brazil.

Karla Mazarelo Maciel Pacheco
Programa de Pós-Graduação em Design, Universidade Federal do Amazonas, Amazonas, Brazil.

Abstract

The Amazon Informatics Law derives from a National Law, but is specific to the northern region, except for Tocantis and Pará states and, in partnership with the Zona Franca de Desenvolvimento - ZFM (Development Free Zone) project regulated by the Superintendência da Zona Franca de Manaus - SUFRAMA (Superintendence of the Manaus Free Zone), it aims to be a public policy to promote social development. It was questioned how the process of execution of this Law works and what would be the impacts resulting from its execution. The objective of this research is to know the process of execution of Research and Development - R&D projects based on the Amazon Informatics Law. For this understanding, a descriptive and documentary research was done to understand the current situation of R&D in the Western Amazon, and through an interview and case study, it was possible to understand and delineate the process itself.

Keywords: *Amazon Informatics Law*; *Research and Development*; *Execution process of R&D projects*.

1. Introduction

Public policies in Brazil are recognized as a means to achieve the social development of the country, as a result of this and the uneven development index among the five regions that comprise it, it was realized the need to create targeted public policies, thus, and in this way, was enacted the Law number 8.387 of December 30, 1991, the Amazon Informatics Law.

The Amazon Informatics Law derives from the National Informatics Law that is valid at the national level, but the first is valid only in the area in which the Western Amazon is considered, composed of the states of

Amazonas, Acre, Rondônia, Roraima and recently Amapá. While the National Informatics Law is the responsibility of the Ministry of Industry, Foreign Trade and Services, the Amazon Informatics Law is the responsibility of the Superintendence of the Manaus Free Zone.

Geographically, this organization and connection of states, as well as its inspector, is located in the capital of the state of Amazonas, the city of Manaus, because of the fact that it has the largest concentration of companies responsible for the investment that encourages the application of this Law. is called Industrial Pole of Manaus, or specifically Zona Franca of Manaus.

The main objective of the Amazon Informatics Law is to "support local systems of Science, Technology and Informatics, aiming to contribute to the creation of efficient technological base with the potential to meet demands, making possible the consolidation of the Industrial Pole of Manaus" (SUFRAMA, 2018).

Due to the importance of this Law, and especially of the application in its fullness and in a correct way so that it has good results, it was questioned how the process of execution of the Amazon Informatics Law works? What are the impacts of this process on the implementation of the Law?

Therefore, the objective of this research is to raise the process of execution of the Amazon Informatics Law, as well as to understand the impacts caused by each one of the execution phases. Thus, in order to fulfill the objectives and answer the proposed questions, a descriptive and documentary research was carried out in order to understand the current situation of R&D in the Western Amazon, in addition to interviews with the actors involved, which allowed a more detailed design of the execution process.

1.1 Manaus Free Zone and Superintendence of the Manaus Free Zone (SUFRAMA)

The Manaus Free Zone - ZFM, according to SUFRAMA (2015) is a model of economic development, idealized by Federal Deputy Francisco Pereira da Silva. It was implemented in 1967, through decree 288 of Law 3.173, by the Brazilian government of the time, and today it has 50 years of existence with renovation until the year 2073.

The main objective of this economic model was the introductions and establishments of three different poles in the Amazon, the industrial, the commercial and the agricultural. To achieve this, a physical area was used for the location of the poles, which currently covers 10 thousand square kilometers in the city of Manaus, capital of the state of Amazonas.

The companies that are present in this area receive fiscal and extra-fiscal incentives with the objective of attracting them and keeping them at the polo, making it a strong locational competitor in the national territory, and consequently socially developing the surrounding area through hiring of the workforce.

The western Amazonia region, which initially covered only the states of Amazonas, Acre, Rondônia and Roraima, was defined in the same year of creation of the ZFM project in order to occupy the states mentioned to protect and maintain their integrity, such as the areas of natural reserves. The idea of linking the ZFM project with the Western Amazon occurred only in 1968 through Decree number 356/68.

This juncture saw the opportunity to create the Free Trade Areas, which are cities belonging to the Western Amazon, in addition to Macapá and Santana, which have international borders and offer incentives for the Tax on Industrialized Products and the Tax on the Circulation of Goods and Provision of Services.

Currently there are five Free Trade Areas, such as "Boa Vista and Bonfim, in the State of Roraima; Guajará-

Mirim, in the State of Rondônia; Brasiléia, with extension to Epitaciolândia, and Cruzeiro do Sul, in the State of Acre; Tabatinga, in the State of Amazonas; and Macapá and Santana, in the state of Amapá" (SUFRAMA, 2018).

In this way, the Superintendence of the Manaus Free Zone, which was already the body responsible for supervising the ZFM project, was also responsible for the Free Trade Areas, which mainly aim to open new companies in order to generate jobs and strengthen the commercial sector, besides the inspection on the entry and exit of products in the country.

This whole model has been strengthened over the years, and has undergone adaptations to make it more efficient in order to fulfill its objectives, so much so that one can cite five main phases through which it has passed. The first phase lasted 8 years and comprised the period from 1967 to 1975, in which commercial activities predominated, domestic tourism, expansion of the tertiary sector and the initiation of industrial activities in the region. The second phase lasted 15 years and comprised the period from 1975 to 1990, with relevance to the organization of the public policies related to the ZFM, such as the establishment of annual global import limits, and especially the issuance of decrees establishing Minimum Indices of Nationalization for industrialized products in the pole.

Figure 1. Scope of the Western Amazon Model.

It can be affirmed that the first phase of the ZFM project occurred in order to experiment with the new economic model, until then not glimpsed, so that in its second phase solidify the decisions in order to contribute in its benefits, proof of this is that according to SUFRAMA (2015) in 1990, the assembly industry was growing in Manaus, even fueling industry at a national level with revenues of US $ 8.4 billion, which led to the first extension of the expired economic model to another 10 years.

In its third phase lasting only 5 years, covering the period from 1991 to 1996, the economic model needed

to adapt industrial policy in force at the time, resulting from the Brazilian Program of Quality and Productivity and Industrial Competitiveness Program. With this, the new ZFM economic model adopted an 88% reduction in the Import Tax, in addition to the adoption of Basic Productive Process of goods and services that comprised the companies located at the polo, as well as established Law number 8.387/9, the Amazon Informatics Law.

In its fourth phase, with a duration of 6 years, in the period from 1996 to 2002 with the Real Plan, the ZFM project underwent a new adaptation, which among the main events culminated in new criteria for financial onleading's of SUFRAMA, the search for expansion of technological competitiveness and the initiative for the creation of a hub of bio-industries. At this stage, SUFRAMA became an articulator and mediator of regional interests.

Finally, in its current phase after the various adaptations undergone, the main concentration of SUFRAMA as the body responsible for the operation of the ZFM is the "increase in gross fixed capital formation, greater private sector spending on research and development (R&D), and expansion of Brazilian exports, especially of micro and small enterprises ". (SUFRAMA, 2015)

It is considered that the main sector that promotes the objectives of SUFRAMA is the industrial pole, are more than 500 companies of the type installed industries, manufacturing the most diverse products and generating employment directly and indirectly, of which 54 have adhered to the Amazon Informatics Law.

1.2 Informatics Law

Among the Priority Actions of SUFRAMA is the stimulation of Research and Development - R&D through the Amazon Informatics Law, it works in a way that companies located in the Manaus Free Zone, at the industrial pole, that produce goods and services exclusively from 5% of their gross annual sales in the internal market, in R&D. In order for the Law to be fulfilled, since it is specific to the region considered as the Western Amazon, R&D should be carried out only in the area that comprises it, namely the states of Amazonas, Acre, Amapá, Rondônia and Roraima.

On the other hand, the 54 companies that have adhered to the Law guarantee tax incentives for their products that are industrialized in the Free Zone, that is, "industrialized informatics goods in the ZFM with a project approved by the Board of Directors of SUFRAMA and that are not destined to the active of the company" (SUFRAMA, p.126, 2016). The quantity of products by companies that request the incentive varies from one to eight different types. Most are models of cell phones, boards, batteries and video monitors.

R & D activities are considered "I - theoretical or experimental works carried out in a systemic way to acquire new knowledge [...] II - Systematic work [...] to develop new materials, products, devices or computer programs [...] III - training or qualification of middle and higher levels" (BRAZIL, 2006, p.5)

The above activities can not be performed by any person or entity, and in any way. There is a rigorous process to follow, only teaching, research and development institutions that are "research centers or institutes maintained by Federal and State Public Administration bodies and entities, [...] research centers or institutes, foundations and other organizations of private law and Brazilian educational entities "(SUFRAMA, p.126, 2016) can offer projects to companies to be fostered in the form of agreements.

With regard to the activities and the institutions that can develop them, the promoter employs according to Costa et. (2017) 5% of gross sales, of which 2.7% can be applied in the company's own environment and 2.3% in the external environment, and of these, 0.5% are applied in the Fundo Nacional de Desenvolvimento da Ciência e Tecnologia da Amazônia - FNDCT (National Fund for the Development of Science and Technology of the Amazon).

1.3 Innovation in the Western Amazon

Innovation is the act of introducing novelties according to the Aurélio Dictionary (2018), and according to the public policies employed in the Western Amazon region, is the crucial and determinant factor of the success of an R & D project that has received investment. Innovation "is driven by the ability to establish relationships, detect opportunities and take advantage of them" (Tidd and Bressand, p. 4, 2015), and this is a good argument for why this word is intrinsically linked to public development policies technological development.

Barros, Claro and Chaddad (2009) affirm that the innovation process can not be disassociated from the relation of the agents involved and from research and development, since it can be seen as an organizational and institutional arrangement.

In order to contribute to social performance and development in the northern region, specific public policies were created, as Costa et. al (2017) one for companies that wanted to invest specifically in the region, and another for companies that wanted to invest nationally and even in the region mentioned.

In this way, the resources invested in the northern region are based on large companies located in the industrial zone, but with a specific law and the use of resources from a national law, the investments applied in the north are still the smallest in Brazil. In the case of Science and Technology - S&T, and Research and Development - R&D is a difference of 66% and 78.7% respectively for the first place, the southeastern region (MCTIC, 2017), demonstrating still be a considerable delay.

For Feitoza et al (2015), the city of Manaus, one of the most important in Western Amazonia, has international recognition as a manufacturing hub, but it does not attract investment due to low skilled labor and the lack of autonomy of local companies to design and approve projects.

Taking into account this situation that aggravates the investments and consequently the innovation scenario of the Western Amazon, it can be said that "the development of science and technology has been shown as a necessary, though not sufficient, condition for the development of the country "(Silva, Ieis and Farah Jr., p.77, 2015).

An alternative to overcome this situation that the technology institution has been adopting, besides the importation of national labor from other regions is the use of new models in project management, according to Silva and Melo (2016) with the intention of fortifying the strategy in conducting solutions in dynamic and competitive scenarios. A more agile posture is adopted, but with the documentation of all relevant phases and activities in order to preserve the project, ie the use of the hybrid model "associates the good practices of the traditional project management model, used in more complex scenarios. stable and well-defined scopes, with the good practices of the agile model of project management "(SILVA and MELO, p. 452, 2016).

2. Methodology

This research is descriptive and documentary, as well as bibliographical with a qualitative approach aiming to know the process of execution of Research and Development projects of the Law of Informatics of the Western Amazon, including from the phase of submission and development of the projects to the deliveries necessary for its closure. The research also used the reading and qualitative analysis of Law number 8.387 of December 30, 1991, the Amazon Informatics Law on Informatics and other institutional documents, as well as interviews according to the methods of Gil (2008).

Based on the methodology of Yin (2001), a case study was also carried out with a multinational company of the information technology sector, defining as unit of analysis the process of execution of the R&D project used by this company, through interviews with the professionals who were directly involved in the process of executing the projects and data found from queries to the assigned business documents, it was possible to organize a framework with stages of the process of execution of R&D Projects based on the Amazon Informatics Law. For this research no study propositions were raised.

3. Results obtained

The results presented here follow from the process of execution of R&D projects of a multinational in the field of information technology that has been active since 1995 in the industrial zone of Manaus, belonging to the Free Zone. This is part of the group of 54 companies that receive the incentive of the Amazon Informatics Law, and therefore invests in projects through agreements, in addition to having its own Research Institute that has three units in the region, and other units distributed in other Brazilian states. Table 1 shows the result of the survey done in the mentioned company.

Table 1. Process of execution of R&D Projects based on the Amazon Informatics Law.

Document / Action	Responsible for creation	Responsible for validation	Description of Action	Comments
Document Basic Production Process	Company benefited	SUFAMA	Create the document containing the description of the minimum set of operations, in the factory, which characterizes the effective industrialization of a given product.	All or a considerable part of the product must be produced in the Manaus Free Zone.
Work plan	Educational and Research Institution	Company benefited	Create document content conceptual and technical information of the project to be fostered.	Only projects approved by the beneficiary company enter into agreements and complete the document R&D Plan

				delivered to SUFRAMA.
R&D Plan Document	Company benefited	SUFAMA	Create document to discriminate the investments in R&D to be carried out in a certain period.	None
Project Tracking Report Document	Educational and Research Institution	Company benefited	Create a document with activities carried out during a short period of the project to accompany the sponsoring company in order to avoid non R&D activities occurring.	R&D activities are actions or projects resulting from the R&D plan for investments in R&D
Project Demonstration Report Document	Educational and Research Institution	Company benefited	Create final report with technical information, results achieved and proof of expenses related to the project executed in the base year of SUFRAMA.	This document is for inspection of the project by the benefiting company before the final delivery to SUFRAMA. It covers the period from April to March.
Reporting Document of R&D	Company benefited	SUFAMA	Create Final report to demonstrate the realization of the investments according to document R&D Plan.	This document contains all the Demonstration Report of execution of all the projects fomented by the company.

In order to better understand the stages of the identified process, Figure 2 (in portuguese) was elaborated to show the flow of inputs, outputs and analyzes for returns.

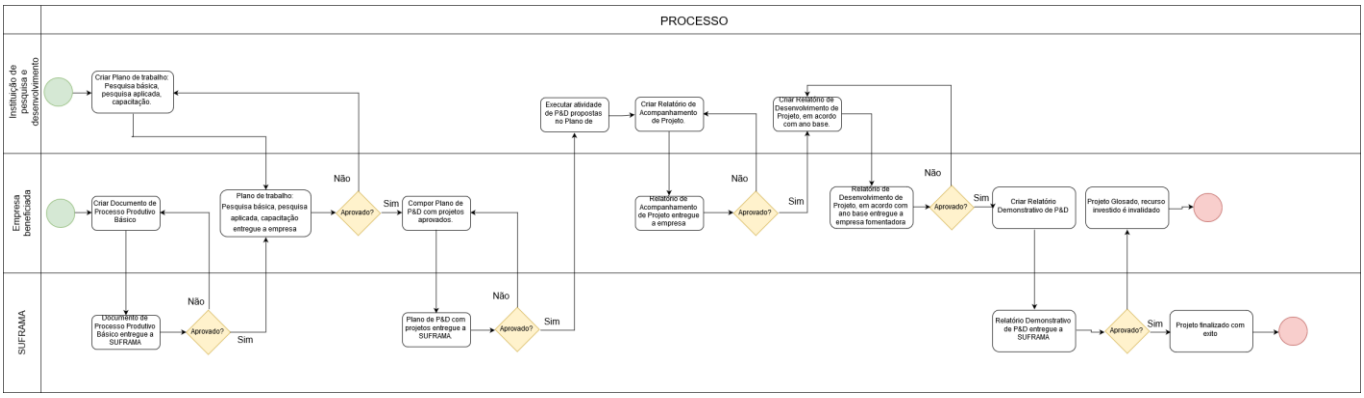

Figure 2. R&D project execution process

With regard to the product development process (PDP) used by the company, the steps take place in a linear fashion, with research and training carried out in parallel. Sprints are held with daily meetings for decision making (Figure 3 in portuguese).

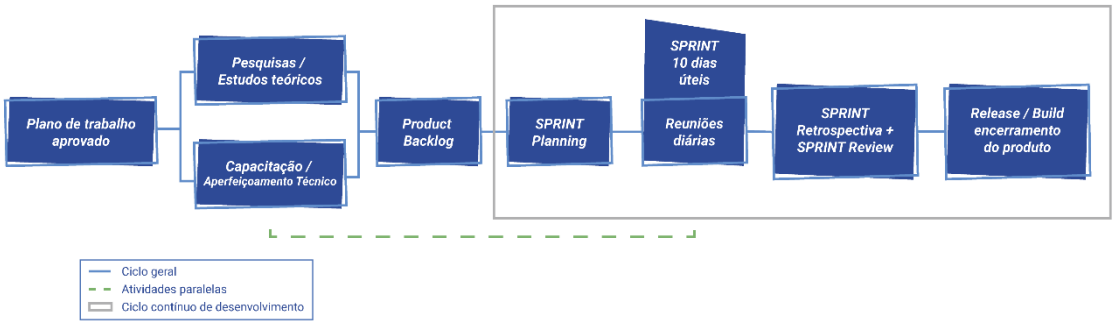

Figure 3. Product development process of R & D projects

It can be said that the process of execution of R&D projects identified have three major phases involving: (i) submission; (ii) execution, and; (iii) finalization, however, the initial approval for the development is related to the direct or indirect benefits of the project to the promoting company. One factor that also proves crucial is whether the project that is developed has a bias related to the technologies the company makes, such as developing applications for a mobile phone company, for example.

Gonçalves, Melo and Júnior (2015) affirm that the research projects, submitted for the appreciation of the promoting companies, require that the responsible for this decision to evaluate the investment in order to translate the strategic direction of the company, and that the portfolio must contain the information of the situation lived by the company.

The idea of the product to be researched and developed, as well as its technical characteristics, are elucidated in the documentation of the Work Plan for appreciation of the company. In the plan are described items such as objective, motivation, justification, general information, project methodology, development process, activity plan, risk plan, human resources plan and cost plan. Only after approval of the company does the transfer of a portfolio containing all the projects with the items previously mentioned, for appreciation and approval by SUFRAMA.

4. Discussion of the results

It is understood that SUFRAMA, as the responsible agency, considers the innovation factors of each portfolio "not only in the opening of new markets, it can also mean, new ways of serving already established and mature markets" (TIDD and BESSANT, p. 4, 2015). This ratifies the information previously found related to the company's interest in promoting projects that benefit it, as well as expanding the market and the use of its products.

When approved by SUFRAMA, the projects are monitored according to the policies of the sponsoring company. In the case of a Korean multinational in the area of information technology, there is a technical staff of at least twenty R & D specialists who are responsible for monitoring as closely as possible all the projects promoted in order to verify the progress of activities and expenditures . To do this, each specialist holds weekly or biweekly meetings with the technical manager or project coordinator, in addition to receiving reports regarding activities, deliveries and expenditures during the same period - noting that on average this professional accompanies up to 10 projects.

The documents submitted referring to the activities are derived from the R&D product development process, among which we can cite the scientific publications related to the research carried out for the product base; the backlog document containing all the functionalities and specialties of the product that should be executed in the work periods, the so-called sprints; user stories that are the overviews of activities, as well as the report of tasks performed for users' stories to be accessed; and the technical delivery of build or release, which is nothing more than a specific module of the final product that is in the process of development.

None of these reports are delivered directly to SUFRAMA by the institution responsible for the project, as they serve only for informational purposes and assistance in the preparation of the Project Demonstration Report. It contains the main activities developed during SUFRAMA's base year, from April of the previous year to May of next year, as well as the results achieved through these activities.

The results of R & D, despite having a qualitative orientation, are quantified for the purpose of measurement and evaluation by means of "patents deposited in Brazil and abroad, granting co-ownership or participation in the results of research and development to partner institutions; prototypes, processes, computer programs and products incorporating scientific or technological innovation; scientific and technological publications in periodicals or scientific events with peer review; dissertations and theses defended; trained or trained professionals; conservation of ecosystems and other indicators of improvement of employment and income conditions and promotion of social inclusion" (BRAZIL, p. 6, 2006).

After reviewing the Development Report of each project by the sponsoring company, if approved, it is inserted in a R&D Development Report for all the projects described in the R&D Plan executed in its base year, together with the project financial plan which also includes proof of the amounts spent.

Lastly, the Final Development Reports of each company are analyzed project by project by a technical representative of SUFRAMA. A total of twenty analysts are responsible for the analysis and approval of all R&D project reports carried out in the Western Amazon region, which makes the entire process time-consuming and time-consuming, averaging 3 years for the discharge of accountability. Companies with projects approved after analysis, may continue to enjoy the tax incentive law, however, companies with

glossed projects are suspended from granting exemption from taxes, without compensation, and also, interest and arrears are added.

Based on this, all the documents are important for the analysis of research projects because, as Jardim (2015) affirms, the projects have to do with planning, control and direction, and its management has to do with the field of administration, which can also validate the effectiveness of the Informatics Law.

In this sense, in most cases the documents presented contain problems and require the efforts of the entire team of analysts. In addition, there is a redundancy of items in the required documentation that could be solved with more objective applications, since in the analysis, the control, planning, production, processing, use and information contained in the report documents are considered, management document is not analyzed in full, as already mentioned by Jardim (2015).

4. Conclusion

In general, the Western Amazon region still lacks greater efforts related to investment in R&D, despite fiscal incentives and the existence of public policies to facilitate the implementation process of these innovation projects.

One of the reasons that may be related to this is the bureaucracy related to the access of public investment resources, since the submission of projects is restricted to legal entities, most of which are public institutions of teaching or research. The criteria defined and used by the companies to choose the development portfolio are also mentioned, and they may choose to invest only in projects that bring benefits to themselves, and there is no legal restriction in this regard. Such behavior makes many good projects, without link to the company's theme, be discarded, because the choices of projects to compose portfolio depend on the strategic objectives of companies, as Gonçalves, Melo and Junior (2015) cites. Finally, there is a lack of knowledge or understanding about the Amazon Informatics Law, since as all laws may have different interpretations, there are no courses with training for this and, as quoted by the regulator's own experts, SUFRAMA , the qualification is done in a self-taught way and, occasionally, by consultants.

It is noteworthy that the objective of this research was achieved when the implementation process to which the R&D projects carried out under the Amazon Informatics Law were submitted, concluding that the impacts caused by bureaucracy and redundant documentation are visible, mainly in the slowness of the process when under analysis.

7. References

[1] A.C. Gil, Como elaborar projetos de pesquisa, Atlas, São Paulo, 2002.

[2] A.R.R. Costa, N.M. Barbosa, R. Sbragia, N.S. Marques, and A.S. Guimarães, Análise dos entraves e facilitadores no processo de obtenção de recursos para P&D na Amazônia Ocidental, EAD/FEA/USP, São Paulo, 2017.

[3] Brasil, Decreto nº 91.146, de 15 de março de 1985. Cria o Ministério da Ciência e Tecnologia e dispõe

sobre sua estrutura, transferindo-lhe os órgãos que menciona, e dá outras providências, Diário Oficial, Brasília, 1985.

[4] Brasil, Indicadores Nacionais de Ciência, Tecnologia e Inovação, 2017, MCTIC, Brasília, 2017.

[5] Brasil, Lei nº 13.341, de 29 de setembro de 2016. Altera as Leis nos 10.683, de 28 de maio de 2003, que dispõe sobre a organização da Presidência da República e dos Ministérios, e 11.890, de 24 de dezembro de 2008, e revoga a Medida Provisória no 717, de 16 de março de 2016, Diário Oficial, Brasília, 2016.

[6] Brasil, Lei nº 8.248, de 23 de outubro de 1991. Dispõe sobre a capacitação e competitividade do setor de informática e automação, e dá outras providências, Diário Oficial, Brasília, 1991.

[7] Brasil, Lei nº 8.387, de 30 de dezembro de 1991. Dá nova redação ao § 1° do art. 3° aos arts. 7° e 9° do Decreto-Lei n° 288, de 28 de fevereiro de 1967, ao caput do art. 37 do Decreto-Lei n° 1.455, de 7 de abril de 1976 e ao art. 10 da Lei n° 2.145, de 29 de dezembro de 1953, e dá outras providências, Diário Oficial, Brasília, 1991.

[8] C. Silva, F. Ieis, and M. F. Junior, "As Interfaces da Política de Ciência, Tecnologia e Inovação com a Política Industrial: Dilemas na Trajetória Recente do Brasil. Desenvolvimento em Questão," Editora UNIJUI, Rio Grande do Sul, 2015 pp. 60-100.

[9] C.G.B. Feitoza, Conceitos e definições acerca da lei de informática: sua aplicação como ferramenta de incentivo a pesquisa, desenvolvimento e inovação tecnológica do setor da tecnologia da informação no Brasil. Congresso Nacional de Excelência em Gestão, Inovarse, Rio de Janeiro, 2015.

[10] H.M. Barros, D.P. Claro, and F.R. Chaddad, "Políticas para a inovação no Brasil: efeitos sobre os setores de energia elétrica e de bens de informática," Revista de Administração Pública – RAP, Rio de Janeiro, 2009, pp. 1459-1486.

[11] J. Tidd, and J. Bressant, Gestão de Inovação, Bookman, Porto Alegre, 2015.

[12] J.M.C. Jardim, "Caminhos e perspectivas da gestão de documentos em cenário de transformações," Acervo, Rio de Janeiro, 2015 pp.19-50

[13] L.R. Gonçalves, A.M. Mello, and A.S. Torres, Composição de carteira de projetos de P&D com recursos públicos: dificuldades e soluções, RAI - Revista de Administração e Inovação, São Paulo, 2015.

[14] M.R. de Bastos, Levantamento de Boas Práticas Internacionais e de Práticas da Gestão da Qualidade para Avaliação de P&D, Ministério da Indústria, Comércio Exterior e Serviços, Brasília, 2016 pp.1-59.

[15] MDIC. Levantamento de requisitos e especificidades da Lei de Informática na SUFRAMA. Ministério da Indústria, Comércio Exterior e Serviços, MDIC, Brasília, 2016.

[16] R.F. Silva, and F.C.L. Melo, "Modelos Híbridos de Gestão de Projetos Como Estratégia na Condução de Soluções em Cenários Dinâmicos e Competitivos," Revista Brasileira de Gestão e Desenvolvimento Regional, São Paulo, 2016 pp. 443-457.

[17] R.K. Yin, Estudo de caso – planejamento e métodos, Bookman, Porto Alegre, 2001.

[18] SUFRAMA. Histórico ZFM. Superintendência da Zona Franca de Manaus, 2015.