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**GOVERNMENT-MANDATED OPEN SOURCE DEVELOPMENT: THE CASE STUDY  
OF VENEZUELA**

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**ABSTRACT**

This research examines the Bolivarian Republic of Venezuela, which because of high revenues from oil exports finds itself in the unique position of possessing the economic ability to support the development of an internal Information Economy. Simultaneously, The Bolivarian Republic of Venezuela has established two government ministries, those of Science and Technology and Telecommunications and Informatics, and developed national policies, which directly encourage the development of an internal information economy. As an example of these efforts, the Bolivarian Republic of Venezuela has chosen to encourage, develop, and support the use of Open Source operating systems and software for all of its government agencies and affiliated partners. Since the country has recently moved to nationalize its largest industry, oil, and its telecommunications sector, this move to Open Source is more significant than it might have been in a country with a less centralized, socialist government. This project looks at the initiatives that the government of the Bolivarian Republic of Venezuela is proposing. This research hopes to find how the use of Open Source as a governmental mandate in public offices stimulates the creation of human resources, new technologies, and ultimately the development of a country.

**1. Introduction**

While each country may have the same goal of furthering its economic development through creating a better standard of living for its citizens, each nation has a different path to approach that goal. Acknowledging that each country experiences social and economic impetuses to change differently, the path they take to developing their economies must be fundamentally different. We are specifically interested in the role Open Source initiative take in economic

development of a country when they are promoted, sported or mandated by the national government.

For the purposes of this work, we have focused on the case study of Venezuela, which has recently mandated the development and use of Open Source products within public agencies. Venezuela provides us with an interesting case in terms of studying national level telecommunications policy. Venezuela is a developing country leapfrogging into the global information society, with the advantage of having one of the largest petroleum and mineral reserves in Latin America. These resources provided Venezuela with a unique opportunity to achieve economic and social development, unlike much of the rest of Latin America, at the cost of remaining highly dependent on the petroleum sector. This effectively opened a policy (Kingdon, 1995) window in which the nation began to develop economic and educational policies to make good use of their increasing wealth.

In response, Venezuela has been rapidly crafting telecommunications policies and the ministries to enact and enforce them. Venezuela established the Ministry of Science and Technology (MST) in 1999 and the Ministry Telecommunications and Informatics in 2006. The principal policy document (Plan Nacional de Ciencia, Tecnología e Innovación 2005-2030) was published in 2005 and encouraged the development of a new scientific and technological culture in which scientific and technological activities should be participative, multidisciplinary, integral, and collective-oriented. Following this line of thought, the policies espoused three main goals: (1) to achieve scientific and technological independence, (2) to promote science and technology oriented for social inclusion, and perhaps less emphasized (3) to build national human resources.

Addressing all three of these goals is the national initiative to migrate all governmental agencies to open source. Following the idea of "endogenous development" Venezuela has chosen to encourage, develop and support the use of Open Source operating systems and software for all of its government agencies and affiliated partners. Since Venezuela has recently moved to nationalize its largest industry, oil, and its telecommunications sector, this move to Open Source is more significant than it might have been in a country with a less centralized, socialized government.

The Bolivarian Republic of Venezuela provides us with an interesting case in terms of studying national-level telecommunications policy toward the economic development of a nation. The Bolivarian Republic of Venezuela (81th in the world by The Networked Readiness Index Ranking) is a developing country leapfrogging into the global information society armed with the advantage of having one of the largest petroleum and mineral reserves in Latin America (World Bank, 2006). These resources have provided The Bolivarian Republic of Venezuela with a unique opportunity to achieve economic and social development, unlike much of the rest of Latin America, at the cost of remaining highly dependent on the petroleum sector (CIA, 2006). In the mid 1990s Venezuela began to experience the effects of a global oil boom, flooding the developing country with cash. This effectively opened a policy window (see (Kingdon, 1995)) in which the nation began to develop economic and educational policies to make good use of their increasing wealth.

The Bolivarian Republic of Venezuela created its first Ministry of Science and Technology (MST) in 1999. The Ministry published its principal policy document Plan Nacional de Ciencia, Tecnología e Innovación 2005-2030 in 2005 (Ministerio de Ciencia y Tecnología de Venezuela, 2005). This document reflects the policies that the nation will follow for the promotion of science and technology.

## **2. Review of Relevant Literature**

The implementation of Open Source projects is now a strategic topic for policy makers around the world. The Centre for Strategic and International Studies (CSIS) published a report with a summary of government policies towards the use of OSS (CSIS, 2006). The report shows that there are two hundred and sixty five Open Source policy initiatives at the national level. From those policies, Europe has 47.7%, Asia has 27.7%, Latin America has 15.2%, and North America has 6.4%.<sup>1</sup> The categories that were developed by the CSIS to describe the actions suggested by the policies were: Research and Development, Advisory, Preference, and Mandatory. The report indicated that only two countries have passed forms of legislation that makes the use of OSS mandatory in the public administration: Belgium and the Bolivarian Republic of Venezuela.

Much of the prior research discussing Open Software has been focused in the managerial aspects of its development and use in industry. Most of the core research questions in these studies were formulated around the reasons that drive developers to get into Open Source projects and how successful projects were created under the apparent chaos of an open community (Crowston, Annabi, & Howison, 2003; Crowston, Annabi, Howison, & Masango, 2004; Schuster, 2005; Stefano, Manenti, & Parisi, 2005). On the other hand, some authors have analyzed the form of introducing OSS in firms to take advantage of the quality and flexibility of the software and its development (Golden, 2005; Goldman & Gabriel, 2005; Madanmohan & De', 2004). Nevertheless, researchers are now paying more attention to the political and economic consequences of the introduction of Open Source systems into governmental settings (see Lee, 2006).

### **2.1 Open Source Software**

Open Source Software is software that, in its distribution, includes the source code along with the executable program, so anyone (with the right knowledge) is able to make changes to it. Not all open software is the same. Depending on the license, modifications of an OSS can be open (this is the case of the General Purpose License or GPL), or can give more choices to any modification or distribution (non GPL licenses). In this proposal, the definition of Open Software is the one given by the Open Source Initiative. The OSI provides a list of ten characteristics that any software must have in order to be considered Open Source. The ten points can be summarized in three features:

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<sup>1</sup> The rest of the percentage is distributed in other countries such Australia and New Zealand.

- *Source Code must be distributed with the software or otherwise made available for no more than the cost of distribution.*
- *Anyone may redistribute the software for free, without royalties or licensing fees to the author.*
- *Anyone may modify the software or derive other software from it, and then distribute the modified software under the same terms.*

(Weber, 2003, p. 10)

Another form of defining OSS is laying out the differences between it and proprietary software, specifically how these two models of software develop solutions. Tian has summarized the characteristics of these two software development models (Tian, 2006). She uses eight variables to compare Open Source and proprietary software: code accessibility, team member location, environment/norm, team size, product lifecycle, team member characteristic, degree of user involvement, and legal and license issues. I have added a variable: production goals. The comparison is shown in Table [2].

**Table 1. Differences between Private Software Development and Open Source development (adapted from Tian, 2006)**

<b>Software Development Characteristics</b>	<b>Proprietary Software Development</b>	<b>Open Source Software Development</b>
Code accessibility during the development	Not Publicly accessible during and after development	Publicly accessible during and after development
Team member location	Usually co-located	Geographically dispersed
Environment/Norm	Physical/Hierarchical	Virtual Decentralized
Team Size	More or less fixed	Changes frequently, can become very large
Product lifecycle	Traditional	Longer, focus on continuous releases
Team member characteristic	Paid employees	Volunteers, open membership
Degree of user involvement	Relatively low	Very high

Legal and license issues	Few	Many
Production goals	Economic oriented: profits	Non-economic oriented: altruism, personal satisfaction, not for profit

**2.1.1 Open Source and Industry**

In order to understand the use and role of Open Source Software in government, it is essential to see its origins and role pre-governmental use. It seems unlikely that a for-profit business could find ways to incorporate Open Source, or “free” products. Since Open Source Software principles challenge the notion of ownership of intellectual property, it seems that a business model that charges for the use of a piece of software does not make sense within these constructs. The idea of giving away code could be interpreted as “free” code, and it appears incompatible with any form of business seeking profit. Nevertheless, some companies have developed business plans in which they are capable of generating profit from Open Source products. These new business models incorporate the distribution, support and training for use of Open Source products. Scholars have tried to address the issue of these new business models, potential market failures, and the role of Open Source products in industry (quote). Independent of this debate, Open Source Software has been drawing market share away from proprietary software.

Open Source Software is on its way to becoming ubiquitous. Most organizations who interface with IT use forms of OSS without any awareness of that fact (Weerawarana & Weeratunga, 2004). For example, as of February 2007 more than 60% of all web servers were running Apache, an Open Source Software (Netcraft, 2007). Large participants in the software industry are taking advantage of this increasing momentum in the Open Source movement and investing economic and human resources in its development. Some examples include major software companies such as IBM, HP, Oracle, and SUN. IBM has contributed to more than 120 projects and invested more than \$1 billion in Linux development (IBM, 2007). HP sponsors international Open Source-related events and has initiated more than 100 Open Source projects of its own (HP, 2007). Oracle states that the company “is clearly embracing and offering Open Source solutions as a viable choice for development and deployment” (ORACLE, 2007). Finally, Sun’s Java platform is Open Source.

On the other hand, IT managers have begun to study the ways of getting Open Source Software as part of their firms’ platform. As a result, several researchers have studied the Open Source phenomenon from an adoption perspective. The basic premise is that OSS should be evaluated with the same rigor as proprietary software, and the fact that it is “open” should not be the base to make a decision over a proprietary solution. Madanmohan & De’ put in the following way “[I]f the Open Source component offers the best solution and reliability for the price, then it’s the most appropriate” (Madanmohan & De', 2004, p. 66). Under Madanmohan & De’ premise, guidelines to adopt Open Source solution in firms have appeared in bookstores (i.e. Fink, 2003; i.e. Golden, 2005). In those publications, authors have suggested how IT managers should evaluate and select Open Source solutions.

Open Source is not only gathering attention in the private sector. The public sector, as well, seems more and more interested in the adoption of OSS. The next sections put Open-Source-oriented policies from an IT development point of view.

### 2.1.2 Open Source and Governments

Although software is a “low- investment, environmentally friendly, high-growth global industry”, it has become “the most critical and expensive element of the government and business systems” (Tessler, Barr, & Hanna, 2003, p. 1). Therefore, since the 1990s governments around the world began paying attention to Open Source Software. Each government has taken different approach to the topic, and the authors have argued about how a country should create national policy about the OSS and its use. This part provides a summary of the forms of adoption that governments have taken towards Open Source, and a categorization of the literature that analyze Open Source-oriented policies.

Open Source has been a hot topic for researchers. This phenomenon, where a group of people contribute to a project without any monetary rewards, has appealed to social and computer scientists, but the impact of the software, per se, in society has initiated a new line of research. The adoption of OSS by governments has initiated a debate about the role of states in supporting this form of software. The phenomenon is new, so researchers can only be critical of the forms of adoption or describe a specific case. There is not a significant quantitative case that could provide evidence of success or failure of Open Source adoption by governments (Hahn, 2002).

Authors have argued about how a country should generate its policy about the Open Source Software and its use (see Smith, Evans, Bessen). The literature that deals with these policies basically offers three recommendation forms: (1) government should be neutral in the adoption of any form of technology, (2) governments “naturally” ought to choose OSS given the benefits that this provides, and (3) governments should be actively involved and promote the adoption of OSS. Below, I discuss each of these policies in more detail and refer to them as the red, yellow, and green approach, respectively.

The authors in favor of the Red approach argue that the software sector has been successful without the intervention of the government and that “the best catalyst for software innovation and industry growth is the marketplace” (Smith, 2002). Evans believes that governments should not pick winners in the market (Evans, 2002) because, as Bessen agrees, software decisions should be done in base of the merits of the products independently of their model of production (Bessen, 2002). A good summary of the Red position is given by Evans & Reddy in the abstract of their article “Government Preferences for Promoting Open-Source Software: A Solution in Search of a Problem”:

*The article concludes that the software industry has performed remarkably well over the past 20 years in the absence of government intervention. There is no evidence of any significant market failures in the provision of commercial software and no evidence that the establishment of policy preferences in favor of open-source software on the part of governments would increase consumer welfare.*

(Evans & Reddy, 2003, p. 314)

The Yellow approach acknowledges the value of Open Source, but it considers that government should be careful when intervening in the market. Lessig advises that the factors that determine efficiency for government are different from those that determine efficiency for the private sector because government is an institution that looks to benefit the most governmental actors (Lessig, 2002, p. 64). Therefore, the choice of Open Source in one case could represent benefits for external players. The partial neutrality of the Yellow approach is shown in Lee's advice: "The ultimate conclusion is that when two systems are equally suitable, governments may reasonably choose OSS over proprietary software because software industry market failures may justify such support of OSS development" (Lee, 2006, p. 48)

The Green approach has been getting more followers during the last four years, when the number of governmental projects of Open Source adoption has increased. In 2005, Ghosh (Ghosh, 2005) provided an answer for the question "Why Free Software? The author divides the arguments in two groups: overall social benefits and pragmatic arguments. In the first group, Ghosh explains how Open Source can contribute to solve the universal access problem; provide independence, local control and local economic growth; and improve transparency and democratic accountability. The pragmatic arguments are related with the interoperability, security and cost of Open Source Software. Other authors see Open Software as a possibility for developing countries to reduce their IT investments and to open the software monopoly (Weber, 2003; Weerawarana & Weeratunga, 2004). In addition to the quote used in the Introduction of this document, Weber provides also a case for the development of an IT sector in developing countries based in Open Source:

*The Open Source process has the potential to empower developing country end users to customize applications for the very particular needs that often arise in different settings, and allows, through use, the natural evolution of information technologies and systems within unique and specific contexts.*

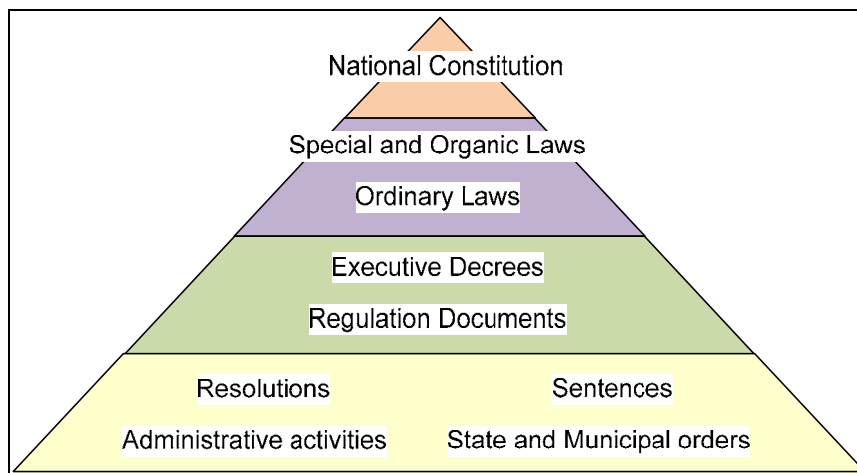
*(Weber, 2003)*

Now, independently of the opinion of authors, the path of Open Source into governmental offices, at local or national level, seems inevitable.

## **2.2 ICT Policies and Kelsen's Pyramid**

In this section we theoretically draw from two systems of policy categorization. We seek tools that will help us better categorize the forms of policy that the Venezuelan government has established regarding the development and use of Open Source Software. First we seek a general system of categorization for all policy that may come out of a government. Here we draw from Hans Kelsen in his 1924 book *Pure Theory of Law* (Kelsen, 2005) introduced a model to explain the logical structure of law, where general rules are at the top and specific rules at the bottom. The norms at the bottom inherit their authoritative power from the top. The logical structure of law can be likened to a pyramid with the most fundamental and authoritative norm (the "Grundnorm") at the top and the most particular norms (those which applied to particular concrete situations) at the base. Kelsen called the passage from general to particular

"concretization". The Grundnorm is inherently stable but may change over time. Figure 1 shows the categorization of Venezuela laws using the Kelsen's pyramid model. The structure of Venezuela's pyramid is similar to most democratic countries, where the Constitution is at the top, general laws are in the middle part, and the rest of legal instruments are at the bottom.



**Figure 1 The Kelsen's pyramid applied to Venezuelan laws (Naranjo, 1982)**

While adopting Kelsen's categorization allows us to place Venezuelan policies in a continuum of most to least authoritative-coercive power, it does not address the nature of the policies themselves, especially in respect to information technologies.

In order to situate Venezuelan Open Source polices according to their relationship with information technologies and development we draw on the work of Alabau. Nations seeking the development of an ICT (Information and Communication Technology) sector in their region typically follow guidelines given by the public sector. Governments, as primary decision makers, provide a set of measures that, at least in their intent, will lead the country to continued economic and social development (Pieterse, 2001, p. 3). Alabau divides these government initiatives aimed at growing the ICT sector into four categories (1) the stimulation of ICT initiatives in the private sector, (2) the stimulation of ICT initiatives in the public sector, (3) ICT deployment as part of territorial planning, or (4) regulation of ICT related activities. Alabau (1997) described each category and provided common objectives for each one.

Initiatives that fit the first category are those aimed at fueling the private sector by creating more jobs or improving competitiveness, and to all citizens in general by improving the quality of life. In the second category the policies seek to improve public activities by the introduction of ICTs. In the category of territorial planning are those initiatives that are in charge of the planning of a city or town, the planning is usually done thinking in the long term and the ICT deployment is an essential part of the overall infrastructure. Finally, the regulation category includes those initiatives that seek to achieve ideal circumstances for the development of ICTs (sane full competition, universal access, interoperability, etc) (Alabau, 1997).

Policies that fit in the last category, regulation, usually have an associated intrinsic legal character and carry the authority of the government behind them. The legal character is the feature that assures national policy will achieve their initial goals. Although most regulations are created hoping that they will be accepted and followed, their legal status oftentimes determines their success. The stronger the legal nature of an ICT policy, the stronger the sanctions against non-compliance, the more likely the policy will have the desired effect.

Drawing from both the Kelsen and Alabau categorization schemes we have the ability to analyze and categorize the Venezuelan policies aimed at Open Source development and use on two axes, amount of authority/coercive power and form of policy tool toward economic development. In the following section we present the Venezuelan case study.

### **3. Research Design: Case Study and Policy Analysis**

The methodology for this research is a case study. Case studies are appropriate as a methodology for this research because the phenomenon of interest in this research is inseparable from its context (Yin, 2003). This method is ideal when a holistic, in-depth enquiry is essential (Feagin, Orum, & Sjoberg, 1991). It is most conventionally executed to analyze problems where the goal of research is to uncover “how” or “why” various phenomena occur, or can occur, as well as to focus on the dynamics a single setting (Yin, 1989) This case-oriented approach involves understanding a small number of cases, which are theoretically important in various ways (Eckstein, 1975; Ragin, 1987). Instead of reducing the complexities of the research problem to independent measurable quantities, this method allows the complexities to remain in their own contexts and analyzed accordingly.

Within the bounds of this case study we conduct policy analysis. Policy analysis is defined by Nagel as “how-to-do methods associated with determining the nature, causes, and effects of government decisions or policies designed to cope with specific social problems.” (Nagel, 1980, p.3). What concerns specific types of data that can be considered policy for the purposes of this research, as noted by Putt and Springer, “in order to maximize the scope of information collected within limited resources, analysts rely heavily on available records, documents, and reports.” (Putt & Springer, 1989, p.89) More formally, the following documents are sources of data for the purposes of this research: legal and procedural documents, which are “central to understanding the formal structure of public programs,” and both internal and external studies and reports.

Nagel classifies policy research methods into four categories, which are determined by the relationships between policies and social forces (Nagel, 1980). Each of the methods is different in what the causes and what the effects are (e.g., looking at “policies as givens and attempting to determine what causes them” (Nagel, 1980). Putt and Springer go further and identify five major types of policy research including exploration, description, causation, estimation, and choice (Putt & Springer, 1989). We primarily engage in description and estimation activities. As a form of description policy research, we describe the policies of the Bolivarian Republic of Venezuela

as they exist. In addition, the policy analyst's task is to acquire sufficient information on the current state of the phenomenon and compare this current state with that described in the policy.

We also engage this policy research through the lens of estimation. Policy analysts study current policy and institutional states in order to estimate the future course of events. These analysts also seek an answer to the question: will the given policy work and will it meet its objectives? Our policy research focused in the Bolivarian Republic of Venezuela asks what will the effects of these telecommunications policies on the overall economy of the country. The differences between description analysis and estimation analysis are that description looks at the current state of things, while estimation looks at the effects of policies and the future state of things.

We employ document analysis as a research tool to determine the frequency and form of risks discussed among project staff. We gathered texts from each project team such as memos, letters, policy documents, public relations press releases, historical documents, speeches, and advertising. These texts will be coded, or broken down, into manageable categories on a variety of levels--word, word sense, phrase, sentence, or theme--and then examined using basic conceptual and relational analysis we quantify and analyze the presence, meanings and relationships of selected words and concepts, then will make inferences about the messages within the texts, the writer(s), the audience, and the culture and time of which these are a part. We use open, axial, and selective coding techniques as applied to this data (Strauss & Corbin, 1998a, , 1998b). Open coding consists of generating basic concepts and conceptual categories from the data. Axial coding is the process of relating the concepts and the conceptual categories to each other. In axial coding the researcher is defining causal relationships and the intervening conditions that mitigate those relationships. The final coding phase is selective coding. In selective coding the researcher refines the relationships and formalizes the generated theory. The methodological technique of document analysis has been well used and documented in its application to organizations and information science (Frohman, 1994; Tuominen, 1997).

### **3.1 The Bolivarian Republic of Venezuela**

The Bolivarian Republic of Venezuela is a Spanish speaking country located in the north of South America. The geography of the country gives access to the Caribbean Sea at the north, being its frontiers shared with Colombia at the west, Brazil at the south and Guyana at the east. Although Venezuela has large pieces of land suitable for agriculture, the abundance of mineral products, especially petroleum, has drove the economy of the country to become a single-product oriented economy.

The oil industry has vital importance in the economy of the country counting for nearly 80% of export earnings and around one-third of GDP (CIA, 2007). However, the value of this sector goes beyond the nation, since the proven oil reserves of the country rank seventh in the world. Venezuela is one of the founding countries of the Organization of the Petroleum Exporting Countries (OPEC, 2007). Even more, this country is one of the principal suppliers of oil to the biggest consumers in the world, the United States. According to the Department of Energy, Venezuela was the third largest supplier of oil during the period of January – October 2005 (Department of Energy, 2007).

Table [2] shows a summary of Venezuelan features in terms of some economic and social variables. As first impression, it is suspect that Venezuelan economic indicators are so optimistic. The GDP forces Venezuela to be classified as an upper-middle-income economy (World Bank, 2002). In addition, for a population of more than 25 million, half of the population has a mobile phone, yet less than one eighth of it has access to the Internet.

**Table 2 Venezuelan Economical Variables**

GDP (per capita)	Unemployment	Inflation	Literacy	Phone Main Lines	Mobile Lines	Internet Uses
\$6,900	8.9%	15.8%	93.4%	3,605,500*	12.496* million	3.04* million

\* 2005 Data

(CIA, 2007)

Revenues originated from the oil business apparently have not caused a significant impact in the industrial sector that is not related to oil activities. The data provided by the Instituto Nacional de Estadística (National Institute of Statistic), Venezuela’s official statistics institute, indicate that the number of industries in the country went from 8.431 in 2000 to 5.970 in 2003, the latest data available from the institution (Instituto Nacional de Estadística, 2007). With a shrinking manufacturing sector, the second biggest employment segment in the economy is the one oriented to services including a 64 % of all labor force (CIA, 2007). Within this sector telecommunications is one of the more dynamic activities, being the segment of the economy that grew the most quickly during the 1990s (Kirkman, Cornelius, Sachs, & Schwab, 2002).

This growth in the Information Technology (IT) industry in Venezuela seems to be supporting the claim that “Information and communication technologies (ICT) have been a core driver of the phenomenon of *globalization*” (Kirkman, Cornelius, Sachs, & Schwab, 2002), and that globalization has an impact in any economy, even for a single-product-oriented one. With nearly 25 million in population and an area of approximately 900 thousand square kilometers, Venezuela is a country with less than 7 internet hosts per 10,000 inhabitants and fewer than 4 internet users per 100 habitants (Kirkman, Cornelius, Sachs, & Schwab, 2002). Nevertheless, the growth of the ICT sector in the last years, Venezuela’s Networked Readiness Index fell from a rating of 50 for the period 2001-2002 (most positive) to 83 for the period 2006-2007(less positive) (Kirkman, Cornelius, Sachs, & Schwab, 2002; World Economic Forum, 2007).

Due to the armed conflict in the Middle East and the growth of Asian economies, the world’s Oil demand has increased. Venezuela has benefited from the oil boom. Oil revenues and the socialist approach of president Hugo Chavez Frías have created a permanently opened “policy window”. Kingdon has explained that public issues become central to governmental debate and later to public action only when a policy window is open due to public opinion, public debate, or will of the administration (Kingdon, 1995). Science and technology is an area where the government has initiated policy changes. The Open Source initiative is a direct result of those recent changes.

## 4.0 Data and Findings

In the past 10 years Venezuela made four efforts to change its technology and telecommunication sector through the establishment of governmental organizations and policies. The government has created two new ministries related to technology and telecommunication policies. Venezuela has passed four major laws regulating technology and telecommunications development and use directly addressing the Open Source issue. The government has created two governmental organizations which support the aims of these laws. Lastly Venezuela has established one official General National Plan in 2005 and has another under development for 2007 specifically related with telecommunications.

Data for this paper was obtained from official Venezuelan web sites: the Ministry of Science and Technology's web site (Ministerio de Ciencia y Tecnologia de Venezuela, 2006), the National Center of Information Technology's web site (Centro Nacional de Tecnologias de la Informacion, 2006), the National Assembly's web site (Asamblea Nacional, 2007), and FUNDACITE Merida's web site. Although several documents from those websites were studied, there are four legal documents and two plans that constitute the core of the data used in this study. The legal documents are: the Resolution #237, the Resolution #238, the Decree 3,390, and the Telecommunications (renamed as Inforgobierno Law). The plans are the National Plan for Innovation, science, and Technology 2005-2030 and the National Plan of Telecommunications, Informatics, and Postal Service. Table [3] shows the documents that were analyzed in this work.

### **The Ministry of Science and Technology and the National Plan for Science, Technology and Innovation**

Just after the election of the president of the Bolivarian Republic of Venezuela, Hugo Chavez, in 1999, the Ministry of Science and Technology (MST) was created. Immediately, the Minister of Science and Technology, Marlene Córdova, was asked to create a comprehensive plan for her new office. After several drafts, the Ministry published its principal policy document the National Plan for Science, Technology, and Innovation 2005-2030 (NPSTI) in 2005 (Ministerio de Ciencia y Tecnologia de Venezuela, 2005). The new policy not only had the endorsement of the president, but the resources of an economy fueled by higher oil prices (CIA, 2007).

In reference to Science and Technology in Venezuela, it is clear that policy makers believe that in order for there to be an economic change there must first be a cultural change. According to the *National Plan for Science, Technology and Innovation* of 2005, Venezuela's old scientific and technological culture was fragmented, individualist, parceled, single-disciplinary-oriented, and linear. The NPSTI encourages the development of a new culture in which scientific and technological activities should be participative, multidisciplinary, integral, and collective-oriented (Ministerio de Ciencia y Tecnologia de Venezuela, 2005). The policies clearly make the connection between cultural changes and economic development in the technological sector. Following this line of thought, the policies espouse three main goals: (1) to achieve scientific and technological independence, (2) to promote science and technology oriented for social inclusion, and perhaps less emphasized (3) to build national human resources.

**Table 3. Documents used in this work.**

Date	Governmental Body, Type of document	Description	Quote
November, 2004	Minister of Science and Technology, <i>Resolution #237</i>	For resolution of the Minister of Science and Technology, Marlene Yadira Córdova, is created the Academia de software Libre (Open Source Academy).	<i>Article 1. It is created the Scientific-technological Program of Research denominated “Academia de software Libre (ASL)”, this program will have as objective the promotion the research, development, innovation, and formation in the Open Source Software area.</i>
November, 2004	Minister of Science and Technology, <i>Resolution #238</i>	For resolution of the Minister of Science and Technology, Marlene Yadira Córdova, FUNDACITE Mérida is in charge of the Open Source Academy	<i>Article 1. To make FUNDACITE Mérida the headquarter of the Program of Technological Investigation denominated “Academia de Software Libre (ASL)”, that was created for this Minister by the resolution #237, dated 11-04-2004.</i>
December, 2004	National Executive, <i>Decree 3,390</i>	The President of the Republic, Hugo Chávez Frías signed the Decree 3,390. The Decree establishes Open Source as a mandatory first option in all governmental systems.	<i>Decree: The National Public Administration will use Open Source Software as first priority in its systems, projects, and informatics services. To such aims, all the institutions and offices of the National Public Administration will initiate the progressive adoption of Open Source Software.</i>
August, 2005	National Assembly, <i>Technologies of Information Law</i> ; first discussion	The article 75 of that law clearly describes the characteristics of the software that the government should use.	<i>Article 75. The organs and agencies of the Public Power, will have to use primarily and by preference in their systems of information technologies, the computer science programs and applications whose licenses or contracts guarantee in an irrevocable way access to the source code of the program by the user ; to execute it with any intention; to modify it and to redistribute the original program as much as its modifications in the same decided conditions of licensing to the original program, without having to pay exemptions to the previous developers.</i>

October, 2005	Minister of Science and Technology, <i>National Plan of Innovation, Science and Technology 2005-2030 (NPSTI)</i>	The Minister of Science and technology published a 152-pages document with the National Plan of Science Technology and Innovation. Open Source is used as part of the strategic goals of the plan.	<i>Strategic goals : (...)5. Migration of the systems of the public administration to Open Source systems until reach a complete adoption within the technological platforms of the State, in a period no longer than 5 years.</i>
August, 2006	National Assembly, <i>Infogobierno Law</i> (before, Technologies of Information Law); second discussion	The National Assembly began the second discussion of the Law of Technologies of Information. The Law now is renamed as <u>Infogobierno Law</u> . The new version has kept a good part of the content of the prior version. Article 67 specifies the use of Open Source Software in governmental offices.	<i>Article 67. The Public Power will have to guarantee that in their systems of information technologies, the computer science programs and applications fulfill the following characteristics: (1) Access to all the source code and the transference of the knowledge associated for its understanding. (2) Freedom of modification. (3) Freedom of use in any area, application or intention. (4) Freedom of publication of the source code and its modifications</i>
April, 2007	Minister of Telecommunications and Informatics, <i>National Plan of Telecommunications, Informatics, and Postal Service 2007-2013</i> ; in process	The Venezuelan government announces the <i>National Plan of Telecommunications, Informatics, and Postal Service 2007-2013</i> .	Using online surveys and board discussions with stakeholders from different sectors of the society and economy of the country, the Minister of the Popular Power of Telecommunications and Informatics is creating a roadmap for the next five years in the area. The delay in the approving of the Infogobierno Law could be and due to the need of fitting the legal document to the new National Plan.

In specifically addressing IT economic development, the NPSTI policies also support both cultural and technological change. Perhaps most important to Venezuela at the current time are elements one and two, developing a national IT workforce that allows Venezuela to become independent from outside IT control. The development of national Open Source Software is the major initiative.

### **Fábrica de Software Libre (Open Source Factory) and Open Source Academy**

In 2004, the Minister of Science and Technology passed resolutions #237 and #238. The resolution #237 created regional bodies for the development of Open Source Software called “Fábrica de software libre” (Open Source factory) (Ministerio de Ciencia y Tecnología de Venezuela, 2006). These institutions are developing Open Source Software to be used in some governmental bodies (municipalities, hospitals and elementary schools) and other forms of entrepreneurship sponsored by the government (small tourism-related business). In addition, Open Source Academies were created to form an IT workforce knowledgeable of Open Source

technologies. The Fábrica de Software Libre and Open Source Academies follow a model similar to the use for the global Open Source community: they share all their development with the public and accept collaboration of any volunteer that want to help with any of the projects.

The resolution #238 assigned Fundacite Mérida as the headquarter for all Open Source Factories. Fundacite stands for *Fundación para el desarrollo de la Ciencia y Tecnología* (Foundation for the development of the Science and Technology), and they are institution created in the late 1980s whose principal objective is to tie regional needs with scientific or technological solutions. They report directly to the Minister of Science and Technology, and there are ten of them distributed evenly in Venezuela's geography: Anzoátegui, Aragua, Carabobo, Falcon, Guayana, Lara, Mérida, Sucre, Táchira, and Zulia. The Fundacite Mérida is the one has assumed the leadership in Open Source initiatives, the Fábrica de Software Libre and the Open Source Academy. Fundacite Mérida is located in Mérida, the capital of the state with the same name at the west-centre of Venezuela, and it was created in 1989 (Fundacite Mérida, 2007b).

The Fábrica de Software Libre has products being used in governmental offices, such as software for the administration of independent governmental offices called SAID, Sistema Administrativo Integrado para Instituciones Públicas Descentralizadas (administrative system for decentralized public institutions) (Fundacite Mérida, 2007a). The system has been deployed since December of 2006 and it has had a good response from public offices. Following Cámara & Fonseca categorization of Open Source projects (Cámara & Fonseca, 2007), SAID is categorized as a project with high shared conceptualization and a low modularity (High-Low case). Camara and Fonseca warn about the risks of the long-term sustainability of these kinds of projects when these are driven by private companies and how the *Open Source credo* is not fully applicable in these cases. SAID is driven by a public body so the risks of implementation are only related with the case of government losing interest in the project. In the short term, this situation seems unlikely to happen suggesting that the SAID project has as much sustainability as the government's interest.

### **Decree 3,390**

In the legislative sense, governmental Decree 3,390 ("Decree 3,390", 2004) provides the legislative platform that makes the use of open source mandatory in all governmental offices. In the educational sense, this same decree creates educational institutes, or academies, for the formation and training of open software developers. This legislation also states that the government will provide political and economic support for the development of these institutes.

Because the Decree 3,390, governmental offices began in 2004 a mandatory migration to open source. In the long term, the migration will also include primary and secondary educational institutions as well as other parts of the national government. This project is described in *The Yellow Book of Open Source: Use and Development in Public Administration* (Ministerio de Ciencia y Tecnología de Venezuela, 2004). The importance of this project for the Venezuela's government is evident in this document, where national IT-sovereignty is compared with national food-supply sovereignty (Ministerio de Ciencia y Tecnología de Venezuela, 2004, p .14).

### **Infogobierno Law (Technologies of Information Law)**

In 2005 the National Assembly began discussing the existing Technologies of Information Law. Initially, the law was intended to provide a comprehensive approach to government procedures related to the use of information technologies. Article 75 of the Technologies of Information specified that the software to be used in governmental offices must have licenses that: “guarantee in an irrevocable way access to the source code of the program by the user; to execute it with any intention; to modify it and to redistribute the original program as much as its modifications in the same decided conditions of licensing to the original program, without having to pay exemptions to the previous developers”. The last description fits most of the Open Source Software and makes almost impossible for other forms of software to be used for the government.

The second discussion took place in 2006, and among the changes that were introduced was a new name. The new name was Infogobierno Law (Government-information Law). In this second discussion, some articles were removed and new definitions were added. The Infogobierno also has an article that specifies the character of the software to be used in governmental offices, the article 67. The article specifies four characteristics of the software: (1) access to the code, (2) freedom of use, (3) freedom of modification, and (4) freedom of publication. This law has not been approved yet. A possible explanation for this is that the government is planning to launch the National Plan for Telecommunications, Informatics, and Postal Service 2007-2013.

### **National Plan for Telecommunications, Informatics, and Postal Service 2007-2013**

In January of 2007, the Venezuelan government created the Ministry of Telecommunications and Informatics. The objectives of this new ministry were to regulate, plan, and coordinate public policies related with technologies of information and telecommunication. One of the initiatives of the new Ministry was to develop the National Plan of Telecommunications, Informatics, and Postal Service 2007-2013. In the process of creating this strategic plan, the Minister has consulted several sectors of society, including the development and use of a website (<http://www.plantic.gob.ve>) to gather information about the requirements of the country in the ICT sector. The plan is expected to be published by the end of 2007 or beginning of 2008.

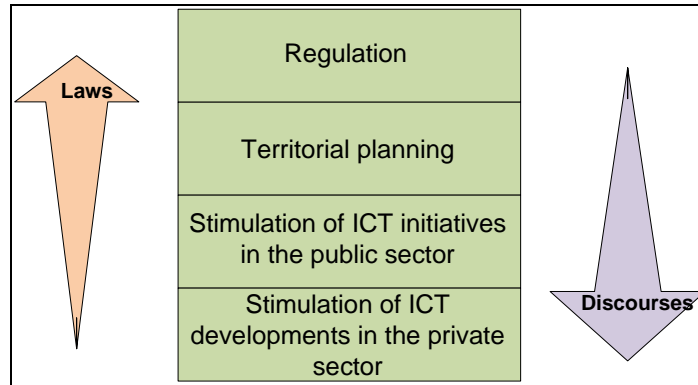
## **5.0 DISCUSSION**

Although policies are “any output of any decision maker, whether it be an individual or a collectivity, a small collectivity or a large one, a government or a nongovernment” (Lowi, 1970, p. 317), usually there are two types: discourses (i.e. speeches or press releases) or legal regulation. In the figure below we have combined Alabau’s four categories of telecommunications policy described in the section 2.2 with the two policy types.

Drawing from both the Kelsen and Alabau categorization schemes we have the ability to analyze and categorize the Venezuelan policies aimed at Open Source development and use on two axes, amount of authority/coercive power and form of policy tool toward economic development. A graphical representation of the legal aspects of ICT initiatives is shown in Figure 2. The category that usually is enforced by laws that involves significant authority and coercion is the *regulation* category at the top of the figure. The category at the bottom of the figure is the *stimulation of the*

*ICT private sector* which is discourse based, inherently less authoritative or coercive than the categories toward the top of the document.

Using this model we can examine the actions taken by the Venezuelan government to promote Open Source development and use over time. We have taken each of the policies listed above in table 3 and plotted them over time.

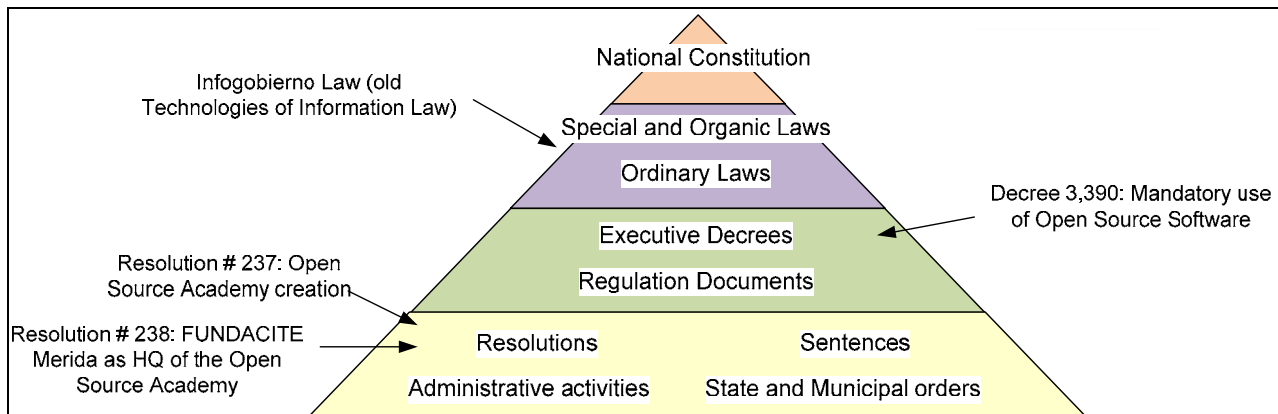


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**Figure 2 ICT policies categorization by legal and discourse content.**

This model is useful because allows us to study the evolution of the Venezuelan Open Source policies. While being a very useful analytic tool, this model is somewhat problematic. In some cases, regulation can be considered as an indirect form of stimulation of the private sector.

Venezuela has tried various approaches to instill the use of Open Source in the country. In the early years Venezuela used several policy statements, which fall toward the bottom of the pyramid. These represented significant discourses around the topic of government use of open source, without significant authority or coercion. See Figure 3 below.



**Figure 3 OSS legal documentation mapped in Venezuela’s Kelsen Pyramid.**

Next Venezuela created (or re-purposed) the Software Factories and Academies, also as a somewhat indirect method of stimulating the development and use of Open Source. These again lack the authority and coercion of governmental policies that may fall higher up on the pyramid. The government of Venezuela decided to push Open Source oriented initiatives in the public sector in order to accelerate the growth of ICT activities in the country. The creation of the Open Source Factory and Open Source Academy are part of this strategy. The Open Source Factory would generate the Open Source Software to be used by the governments and the Open Source Academy would train professionals on the use of this form of technology.

Most recently, the government of Venezuela tried a more radical approach. The Decree 3,390 made mandatory the use of Open Source Software in all governmental offices. This is the most authoritative and coercive of Venezuela's policies toward the adoption of Open Source. This shows a clear policy trajectory toward the more formal and coercive forms of government intervention in the sector. Using Kensel's pyramid model, it is clear that Venezuela's approach to Open Source adoption has been climbing to the top of the pyramid.

#### **4. CONCLUSIONS**

Venezuela's approach to ICT policies, specifically Open Source policies have been focused in pushing ICT initiatives in the public sector. These initiatives have been stimulated not only with discourses printed in strategic plan documents, but with the creation of laws that give legal authoritative character to the policies. When using the Kelsen's pyramid to analyze the kind of legal documentation that have been created around the process of OSS adoption in Venezuela, we found that the use of Open Source Software has climbed to the top of the pyramid: from resolutions, to executive decree, to being part of a Special Law.

Elaborating upon the Alabau model, it is clear that policies that look to enhance the ICT sector of a country pushing public ICT initiatives usually are related with more law creation than those policies that look to stimulate the private sector. Therefore, it is not surprising that Venezuela has decided to take a legal approach in its Open Source Software adoption process. What makes the Venezuelan case interesting is that the legal component includes a mandatory aspect, involving the authoritative and coercive elements of the governmental hierarchy.

Venezuela is one of the few countries in the world that has decided to make the use of Open Source Software mandatory. From the point of view of the country, the adoption of Open Source Software using legal approaches seems fair since the legal measures do not affect free market or competition. On the other hand, from a private sector view, government is eliminating the possibility for different forms of technology to compete (if a piece of software is not Open Source cannot be sold to the government). It would be interesting to compare Venezuela's approach with other countries policies, where the initiatives do not revolve around law frameworks.

Venezuelan Open Source Software policies are still being crafted. The National Plan of Telecommunications, Informatics, and Postal Service 2007-2013 is expected to be published by the end of 2007 or early 2008. Along with this plan, a final version of the Infogobierno Law will

be passed. Given the direction of the legal framework of Venezuelan OSS policies, is likely that the mandatory nature of the Open Source directives will be kept in the new law. Future research will include monitoring the form of this future law, the impact it has on national economic development. In addition, future research must include an analysis of the non-policy, non-legal mechanisms that the government will implement to insure a successful adoption of Open Source Software in the country.

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