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The Process of Introducing FLOSS in the Public Administration: The Case of Venezuela

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Abstract

This study analyzes the mandatory FLOSS policies of the Bolivarian Republic of Venezuela and the initiatives associated with the adoption process. An expanded version of Gallivan's (2001) framework of contingent authority innovation describes the way new policies extended through the public structure of the country. Findings indicate that Venezuela's FLOSS migration process fuses the agendas of social inclusion, sovereignty, and freedom that the government is pursuing with the availability of a "Free Libre" technology. The present project specifically contributes to the literature that examines information and communication technology policies and their impact on developing countries. In addition, the theoretical expansion of Gallivan's framework can apply to other governmental technological adoptions where ideology and politics play critical roles.

Keywords: *Free Libre Open Source Software, Policy introduction, Mandatory adoption, Innovation, Public Administration*

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1. Introduction

During the last fifteen years, the world has seen the increasing and rapid evolution of information and communication technologies (ICT). ICT extends to most human activities, including education, health, and all forms of tangible or intangible goods production. Countries' governments have discovered the need to invest in ICT due to the potential economic returns and the importance of these technologies for other human endeavors. The initial discussion has moved from the debate about the benefits for a country's socio-economic wealth to the reason not all government investments in ICT have successful outcomes (Walsham and Sahay, 2006).

The expansion of ICT also brought a new philosophy for the sharing of knowledge. Software developers began sharing their codes, seeking to improve them and earn a reputation as coders. New licensing forms made it possible to keep these codes open, and a whole culture of openness emerged. The Free Libre Open Source Software (FLOSS) movement has been able to create products that compete with, and in some cases transcend, those of corporations (Watson, 2009). Governments are aware of the success of FLOSS; consequently the idea of using this type of software in government settings has been advancing.

The Government of the Bolivarian Republic of Venezuela enacted legislation in 2004 making the use of FLOSS mandatory in all offices of the national Public Administration. This kind of policy is usually considered purely technological in orientation, and even a continuation of a technologically deterministic approach. Even though Venezuelan FLOSS policies use a discourse that includes elements beyond the economic perspective, the country adopted a more social approach to development. The government of Venezuela employs a discourse related to social and technological gaps, sovereignty, and independence.

The overall research question in this study is: *How have Venezuela's FLOSS policies been implemented?* This research seeks to identify the nature of Venezuela's FLOSS policies by providing an analysis of the critical elements that shape their adoption. The evaluative aspect of this work is less extensive than the strategic analysis part. In addition, the contribution of this research is the description of how the employment of a mandatory policy permeates government bureaucracies and complex organizations.

Venezuela's migration to FLOSS is a unique case in which the introduction of new technology shares an associated philosophy with the dominant political ideology of the country. In addition, Venezuela has an important source of income due to the oil sector, a heavily bureaucratic Public Administration, and a politically polarized population. Under these circumstances the current research presents an objective analysis of the methods for applying Venezuelan FLOSS policies and their contribution to the generation of new ideas for ICT policy makers worldwide.

2. Literature review

Governments are aware of the importance of technology for achieving superior degrees of development, but good practices for the adoption of technological innovations at the national level are still debatable. This is especially true in the case of technological innovations targeting Public Administration settings. The numerous roles and sizes of public offices make it difficult to establish a set of policies that can be implemented consistently.

The subject matter of this study is the adoption of FLOSS by the Venezuelan public infrastructure. This case of technological adoption in public settings has additional complexities. First, the policies behind this action are new and have a legal character, so analysis must include ongoing implementation. Second, the policies do not follow a simple technology transfer model (Onken et al., 2005) since the government is taking advantage of a form of technology that does not have links to specific economic interests. Third, this migration cannot be considered a single and isolated national project, of the type that has been evaluated in the literature (Heeks, 2002). The adoption of FLOSS

includes numerous individual projects that vary in size and objectives. In addition, the government seeks to extend the deep paradigm change associated with embracing FLOSS to other technological and scientific areas.

2.1. Policies and innovation

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 non government" (Lowi, 1970, p. 317). Nevertheless, policies are not static entities; policies are also processes and outcomes (Ball, 1994, p. 15). In line with the previous premise, this study considers the methods by which Venezuelan policies have been translated into actions and the iterative process between discourse and execution.

The concept of innovation has been referred to as "the knowledge base that is used to produce new products and deliver services, to govern and administer societies, and to manage organizations of all types" (Farazmand, 2004, p. 8). In the case studied in this research, the specific innovation is the crafting and use of new software that differs from traditional commercial software in the way it is programmed and distributed. Adoption of this software has a mandatory character; therefore this study's theoretical framework applies theories consistent with top-down analysis.

2.1.1. Governments' reasons for innovation

Governments are complex systems of agencies and relationships (Frederickson, 1999). This description, taken from institutional theory, helps to explain these public organizations' resistance to change (Zucker, 1987, p. 448). The weight of bureaucracy and external political interests make changes especially difficult in governments. Notwithstanding these obstacles, under certain circumstances governments embark on innovation processes. Perry et al. (1991) identified five reasons that could drive an innovation process in government settings: (1) to increase production efficiency, (2) to increase service efficiency, (3) to perpetuate existing decision making and control structures, (4) to increase professional status, and (5) to merely introduce something "innovative."

Feller (1980) focused on the dichotomy of cost-reduction vs. service augmentation for technological innovation in the public sector. He argued that government agencies prefer to support innovations that increase services instead of efficiency. Feller's study made reference to the negative impact that increased costs could have on the reputation of elected officials. In addition, Kraemer and Perry (1999) showed that increased provision of services and budgetary increases are outcomes well received in most public settings.

The reasons given by Perry et al. (1991) can be considered rationales for innovation in non-critical circumstances. For Borins (2008) crises are triggers that allow innovation, and five causes influence public sector innovation: (1) pressure from political leaders/legislators, (2) change in leadership positions, (3) crisis in normal activities with possible failure as an outcome, (4) consummate failures of specific projects, and (5) novel opportunities brought by the development of new technologies. These five causes add a political aspect to the study of the phenomenon of innovation in Public Administration. Perry et al. (1991) also considered a political approach when mentioning the intention to "perpetuate existing decision making and control structures" as a reason that drives innovation.

Analyzing the views of Perry et al. (1991) and Borins (2008) to explain governments' reasons for innovating revealed three appropriate categories: Institutional/Organizational reasons, Political reasons, and Technological chance reasons. Institutional/ Organizational reasons relate to the operation of the body that participates in the adoption of innovation. Political reasons encompass the exercise of power and the desire to maintain the current status. Finally, novel opportunities brought by technology (New Technological choices reasons in this study) relate to technological opportunities and reputation arising from technological innovations.

Table 1 shows a categorization of governments' reasons for innovating, according to the previously cited scholars. The categories describe the character of the reasons: Institutional/Organizational, Political, or New Technological choices. No existing data makes it possible to determine which of the

reasons presented in Table 1 is most popular. Clearly, Institutional/Organizational and Political aspects seem to runs in popularity compared to other reasons for governments' adoption of innovations, according to the literature. The impression that technology-oriented policies are a product of political arguments is not surprising. Majone (1989) even stated that "a policy is best described by the actions of groups seeking selfish goals" (p. 2). Like most policies in the government sector, those related to technological innovation have deep roots in the political discourse of the people in power.

Table 1: Governments' Reasons to Innovate

Reasons	Institutional/ Organizational	Political	New Technological choices
To increase production efficiency	√		
To increase services efficiency	√	√	
To perpetuate existing decision making and control structures		√	
To increase professional status	√	√	
To merely introduce something innovative			√
Pressure from political leaders/legislators		√	
Change in leadership positions		√	
Crisis in normal political activities with possible failure outcome	√		
Consummate failures	√		
Novel opportunities brought by technology			√

Once a government has considered all reasons and made a decision, policies are implemented. The reasoning that guided government officials in making the original policy decision also guides the implementation process. Since the character of the policies studied in the current research is mandatory, the next section elaborates on the implementation process in that context.

2.1.2. The process of mandatory innovation

The adoption of innovation has had extensive examination. Some studies focused on the final stage of adoption, when end users or departments shape their behaviors and adopt the new technology. The Theory of Reasoned Action (Fishbein and Ajzen, 1975) and The Technology Acceptance Model (Davis et al., 1989) are examples of theoretical frameworks built to explain user attitudes (adoption or rejection) to new technologies. Other researchers considered the innovation process at the organizational or divisional levels (see Fichman and Kemerer, 1997; Orlikowski, 1993). The current study is interested in the latter: the organizational and broader social perspective of the process of introducing an innovation.

Gallivan (2001) introduced a useful theoretical framework which includes innovation adoption under a mandatory approach. Gallivan sought to describe cases in which "authorities make the initial decision to adopt the innovation and targeted users have few alternatives but to adopt the innovation and make the necessary adjustments for using it to perform their jobs" (2001, p. 52). He uses the Zaltman et al. (1973) theory of "contingent authority innovation decisions," which asserts that the adoption process within organizations usually occurs in two stages: (1) primary adoption, in which high-level authorities decide to adopt and make the corresponding formal decisions, and (2) secondary adoption or actual implementation of the adoption including end users.

The primary adoption process depends on the availability of the technological innovation and on the objectives and intentions of the authorities: Once the decision is final, the adoption process begins, and other elements such as user behaviors, attitudes, and organizational structure play a role. Gallivan calls the whole idea: "the process of contingent authority innovation adoption." A graphic representation of the process appears in Figure 1.

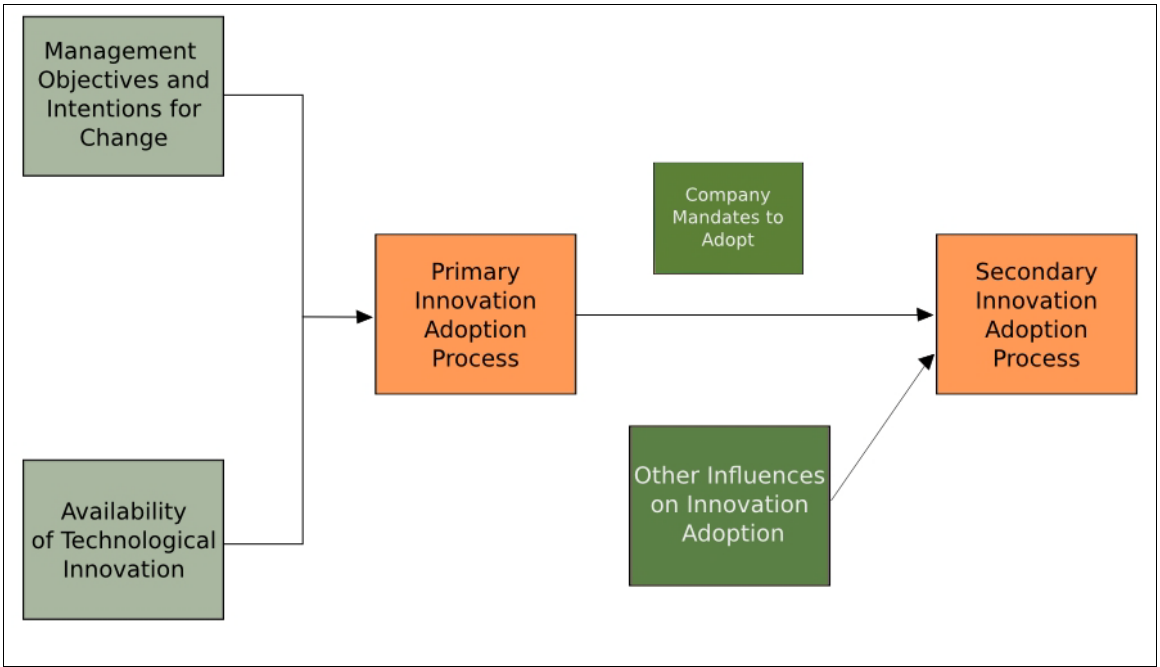

Figure 1: The Process of Contingent Authority Innovation Adoption within Organizations (Gallivan, 2001, p.53)

Between the primary and secondary adoptions, a step occurs that defines which implementation strategies are to be followed. In Figure 1 an isolated box represents this stage. This step has three variations, which differ in rigidity (Agarwal et al., 1997). The most rigid is the total commitment implementation strategy, or mandatory adoption of the innovation throughout the organization. The support strategy is less rigid; managers provide the infrastructure and support for users' adoption of the new technology. Finally a more relaxed strategy mainly focuses on specific pilot projects within the organization and seeks to evaluate their outcomes. This last strategy is the *advocacy strategy* (Agarwal et al., 1997).

Although Gallivan's (2001) framework uses the perspective of a private organization, it applies to governments introducing, by mandate, an innovation in a public context. The current study uses and extends Gallivan's framework.

2.1.3. Governments' approaches to FLOSS

When analyzing government approaches to FLOSS throughout the world, two important dimensions need consideration: the size of the government unit promoting the policy, and how strict the policy itself is. Lewis (2008) categorized government FLOSS policies in four types: research, mandate (FLOSS must be the only option), preference (FLOSS should be the preferred option), and advisory (FLOSS can be considered an option). For Lewis, the policies can apply at the national, state, or local levels. The matrix of the two dimensions described before (policy category vs. size of the government body) for countries that considered FLOSS initiatives in 2008 is given in Table 2.

Table 2: National, State, and Local FLOSS initiatives by Category (Lewis, 2008, p. 2)		
Category	**National**	**State & Local**
R&D	51	17
Advisory	62	13
Preference	47	48
Mandatory	26	11
Total	186	89
Total Initiatives (275)		

According to Table 2, mandatory approaches to FLOSS policies are the least popular both at national and at state and local levels. Policies with an advisory character had more demand at the national level, while preference policies were more popular at the state and local level. An explanation of why mandatory approaches are less popular is that they require the enactment of legal instruments (laws). That is the specific and unique case of Venezuela, where legislation supports a mandatory FLOSS policy.

3. Methodology

This study's methodological approach is an iterative, qualitative data collection scheme. The first reason for this selection has support from Creswell's (1998) statement: "First, select a qualitative study because of the nature of the research question" (p. 17). The research question intends to focus the consideration of factors and elements that cannot be directly measured, so quantitative methods are inappropriate in the research design. This approach allows the elaboration of a richer explanation of the phenomenon.

An analysis of the experiences, decisions, and thoughts of the protagonists provides a "holistic" picture of the phenomenon. Although statistics and the quantification of some variables are important for establishing a perspective of countries' contexts, the current study focuses on the discourses, practices, and meanings that shape the social processes among stakeholders of the process. The kinds of data collected for this research are qualitative: Interviews and policy analysis are the two methods for the data generation process. The term "data generation" in this section implies a certain lack of neutrality in the collection of information, so this term is more accurate than "data collection" (Mason, 1996). Data for this study, generated during one-month in Venezuela spanning April to May 2008, arose from face-to-face interviews with 29 subjects from four institutions plus two other subjects (FLOSS activists). The first three institutions are: CNTI (National Center for Information Technologies), the main ICT consulting public institution; FUNDACITE Merida (Foundation for the Development of Science and Technology), a public research institution pioneering FLOSS development; and CENDITEL (National Center for the Research and Development of Free Technologies), a relatively new public research. The fourth institution is the country's Ministry of Popular Representation which recently migrated to FLOSS. In addition, the 4th National Congress of Free Libre Open Source also took place during the visit and provided an opportunity to interview two activists of Venezuela's FLOSS movement. The total number of subjects interviewed for this study was 31.

In addition, this study used document analysis as a research tool to determine the frequency and

form of risks discussed among policy makers. Document analysis entailed gathering texts, such as memos, letters, policy documents, public relations press releases, historical documents, speeches, and advertisements from each project team. A total of 20 official documents were analyzed.

For the data analysis, open, axial, and selective coding techniques were used (Strauss and 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 one another. Axial coding defines causal relationships and the intervening conditions that mitigate those relationships. The final coding phase is selective coding, which refines the relationships and formalizes the generated theory.

The initial coding generated two main topics: (1) origin of and reasons for the migration to FLOSS, and (2) description of the initiatives for the migration. The theoretical framework used in this study is based on a relationship between context and mechanisms. The coding schema selected fits this frame, meaning that the theoretical constructions considered in the literature review section form the basis for initial code generation.

While the seed for code generation was a decision particular to the current research, the iterative interpretation of the data shaped the final coding schemes. The original theoretical framework incorporated relationships that emerged from the analysis, so the data contributed to the creation of new theory (Strauss and Corbin, 1998a). Weft QDA software for qualitative analysis assisted the generation of codes.

4. Venezuela's political discourse and FLOSS

The Venezuelan political situation is extremely complex and controversial. The president of Venezuela, Hugo Chávez, was elected in 1998 with more than 56% of public support. In 1999, he proposed a new constitution that was eventually approved by popular vote. He legitimated his mandate in 2000 by a voting majority of 59% (the new constitution called for new elections). By 2004, Hugo Chávez's position was challenged (a political tool included in the constitution of 1999), but he was ratified as President. Later, in 2006, he was reelected (the 1999 constitution allows two consecutive terms for the presidency); he had the complete support of the National Congress, and more than 70% of state governors are affiliated to his political party.

In some Latin American countries, socialism has re-emerged in recent years, along with an anti-imperialist stance, rejection of the policies of neo-liberalism, and full or partial nationalization of oil production, land, and other assets. Venezuelan President Hugo Chávez and Bolivian President Evo Morales, for instance, refer to their political programs as socialist. After winning re-election in December 2006, President Chávez said: "Now more than ever, I am obliged to move Venezuela's path towards socialism." (Bowman, 2007) Hugo Chávez adopts anti-imperialist positions and completely rejects neo-liberalism's approaches. He embraced "21st Century Socialism," a concept created by Heinz Dieterich in 1996. According to Dieterich, 21st Century Socialism is achieved when "the majority of the population has the highest degree of decision on the economic, political, cultural, and military institutions that rule their lives." (Marcano, 2008). Hugo Chávez has also declared that his government is socialist because it "puts the social aspect in a first place. Capitalism puts capital in a first place. No, it is the other way around, the social should be first."(Dieterich, 2007, p. 10)

The idea of 21st Century Socialism is embedded in the whole Venezuelan Public Administration, and the discussion of the topic is global (a search on Google for "21st Century Socialism" produced more than 1,200,000 hits in July 2010). The following list describes the characteristics of 21st Century Socialism as adopted by the Venezuelan Public Administration:

1. It is a socialism that is rooted in the thoughts of Karl Marx, Friedrich Engels, Lenin, Rosa Luxemburg, and Antoni Gramsci among others.
2. It is an ecological socialism because it advocates on behalf of nature by way of different models of production such as cooperatives and small enterprises.

3. It is not a paternalistic socialism because it looks to represent the protagonist character of the people.

4. It is a socialism that looks to learn not only from prior socialist experiences but also from indigenous knowledge.

5. It is a feminist socialism because it looks to recognize the role of women in society.

6. It is a custom-made socialism inspired by Simón Bolívar and other national heroes, but which takes lesson from other processes led by historically notable characters (Mahatma Ghandi, Mao Tse-tung, and Jesus).

(MPP para la Comunicación y la Información, 2007)

Chávez's economic model, "endogenous development," is "[A] model that emphasizes the communities, their territories, and their conditions. Given that frame, local advantages and expectations are critical to define and implement the model" (MCT, 2005, p. 77).

One example of how this approach is implemented is that oil money will finance the creation of thousands of small-scale cooperatives in agricultural and other areas to provide jobs and foster community development. A second initiative of Chávez's master plan is something known as *co-gestión*, roughly translated as co-management, in which the state helps workers purchase shares in the companies in which they work to provide a greater voice in management. Chávez's goal is to lift millions from poverty by reducing Venezuela's reliance on oil, which has left the country with weak manufacturing and agricultural bases and an excessive dependence on imports of food and almost everything else.

The FLOSS policies are part of Chávez's plan for endogenous development intended to break Venezuelan dependence on foreign software and hardware. The main justification claims that previous governments spent more on licensing fees for proprietary software than on developing domestic technology and strengthening sovereignty, which have become top priorities for the Venezuelan socialist government. Chávez once called the switch to FLOSS crucial to "stop depending on software owned by others" (*Taipei Times*, 2006). Even more, for him "knowledge doesn't have owners, intellectual property is a trick of neo-liberalism," (*Taipei Times*, 2006).

5. Venezuela's reasons for innovating

Understanding the FLOSS migration process in Venezuela requires familiarity with the government's justification for the adoption of FLOSS. Since Venezuela's approach was mainly legislative, the core policy Decree 3,390 (Government of Venezuela, 2004) requires special attention.

Before Decree 3,390, the government of Venezuela did not have an official public policy related to the use of FLOSS. Some public universities and public technological-scientific institutions were using FLOSS solutions, but their activities were limited to academic applications. Therefore, the only recorded use of FLOSS in public settings before Decree 3,390 appeared in academic initiatives of a small group of specialized communities.

Looking at official documents, no written materials are apparent regarding what discussions or circumstances influenced the president of the Republic to sign Decree 3,390 in 2004. The main sources of information related to reasons and strategies behind the measure are in the document itself, post-Decree publications, and the thoughts of people implementing the migration. The government initiated two processes for adopting FLOSS: 1) A change in perceptions and values of the public related to FLOSS, and 2) a change in software used in public organizations (including training and fostering the software sector).

The first process seeks to reverse myths surrounding FLOSS. According to the CNTI, "Several myths have been created around FLOSS. They have been promoted by diverse players: big technology

sellers such as Microsoft, people who do not know about its features, and people who are reluctant to change" (CNTI, 2009). Some of those beliefs, according to the CNTI, include: (a) FLOSS has bad quality because it does not follow proprietary software processes; (b) FLOSS is a risk because it allows anybody to alter programs; and (c) FLOSS will ruin traditional software businesses. The second process includes all the procedures to replace software and systems in the public sector.

5.1. Decree 3,390

Decree 3,390 is a four-page legislative document describing the policy related to FLOSS that the Government of Venezuela must follow. The president of Venezuela, Hugo Chávez, signed it in December 2004, and the *Gaceta Oficial* (Official Gazette) published it in its edition #38,095 on December 28 of the same year. The Decree, as is common in this form of legislation, has two sections: a preamble explaining four reasons justifying the Decree, and 14 articles that explain the reach of the legislation.

In order to simplify the analysis of the Decree, this study classifies the content of Decree 3,390 according to five elements: 1) justification, 2) core of the legislation, 3) definitions, 4) exceptions, and 5) actions.

5.1.1. Justification

The beginning of the document contains a preamble section. In the first element of the preamble, the government assumes the legislation will contribute to the "production of goods and services to satisfy the needs of the population" (Government of Venezuela, 2004). The second point complements this idea since it specifies that the national software industry will benefit from the measure. In the third item, the government introduces the social aspect of the legislation. Venezuela's central authorities recognize the existence of a social and technological gap in the country, and they state that the introduction of FLOSS will contribute to the closing of that gap by speeding up processes, reducing costs, and increasing the quality of services. The last idea of the preamble asserts that the government believes that the Public Administration will benefit from FLOSS by increasing interoperability among government offices. Also, the technology will decrease response time, increase the quality of services, and improve governability.

5.1.2. Core of the legislation

In the first article of the Decree, the government summarizes the compulsory character of the migration to FLOSS. Venezuelan FLOSS policy originates from this article. In it, the government states that all systems of the government must adopt FLOSS, and that all public offices must begin a progressive and gradual adoption of FLOSS.

> Article 1
>
> The National Public Administration will use Software Libre[1] [FLOSS] as the first priority in its systems, projects, and information technology services. To this end, all institutions and offices of the National Public Administration will initiate the progressive and gradual adoption of Software Libre.
>
> (Government of Venezuela, 2004)

In Article 1, the government admits the evolving character of the migration process of the Public Administration's systems by stating that the adoption of FLOSS in public organizations will take place incrementally. The deadlines and limitations related to the migration appear later in the Decree.

5.1.3. Definitions

In the second article of Decree 3,390, the government provides definitions of four terms used in the rest of the legislation. The four defined terms are: Software Libre (FLOSS), Open Standards,

[1]Software Libre is the term used in the official documents. For the purposes of this paper, this term will be kept in word-by-word translations of Decree 3,390. In the rest of the paper, the term FLOSS will be used.

Proprietary Software, and Software Libre Distribution under Open Standards for the Venezuela State.

> Article 2
>
> Software Libre: Computer program whose license guarantees access to the source code by the user, and allows him/her to execute for any purpose, modify, and redistribute the original program and modifications of it under the same form of license as the original program and without the obligation to pay any fees to previous developers.
>
> Open Standards: Technical specifications published and controlled by the organization that is in charge of their development. These specifications have been accepted by the industry and are available to any user irrespective of whether they are implemented in a Software Libre or not, thus increasing competitiveness, interoperability, and flexibility.
>
> Proprietary Software: Computer software whose license establishes restrictions for its use, redistribution, and modification by the user. Or it requires the authorization of the owner of the license to do so.
>
> Software Libre Distribution developed under Open Standards for the Venezuelan State: A package of programs and applications developed using Software Libre and Open Standards to be used and distributed among different users.
>
> (Government of Venezuela, 2004)

These definitions are important because of the plurality of license forms associated with FLOSS, and the possibility of private software companies using the adjective "open source" only to indicate that they can facilitate the code for users but only for informative purposes. This kind "open source" does not allow the modification of the code. Therefore, the Venezuelan government's definition is critical to avoid difficulties with licensing software used in the Public Administration. The method of formulating these definitions reduces licensing conflicts when choosing the software the government will consider as FLOSS. Venezuela's approach avoided the need to require specific licenses, but specifies the characteristics that the software's license should have.

The definitions separate the universe of software into two parts: FLOSS and Proprietary Software. Accordingly, any software guaranteeing access to the source code and providing rights of use, redistribution, and modification of the program without an obligation to pay fees to previous developers is FLOSS. Consequently the government does not require software to have any specific license for the software used in its systems, but the licenses must follow the definition of FLOSS given in Decree 3,390.

5.1.4. Exceptions

In Article 3 of Decree 3,390, the government allows the use of software not fitting the definition of FLOSS. The article states that when applications required by the end users cannot be developed or acquired under a license that complies with the FLOSS definition, the Minister of Science and Technology can provide authorization to purchase or use proprietary software.

The interested institution must request this special permission from the Minister of Science and Technology. The government included this provision to avoid legal loopholes in the migration. Obviously, not all proprietary software has a FLOSS counterpart. This is especially true for solutions that are oriented towards specific hardware. The government wanted to provide a valid alternative to avoid disruptions to the regular activities of the Public Administration. This exception has been criticized because it lacks further compulsory measures oriented towards correcting the absence of FLOSS solutions.

5.1.5. Actions

The last section of Decree 3,390 describes the actions that the Public Administration must perform to follow the core of the legislation. Articles 4 through 14 of the Decree explain the main guidelines for a national FLOSS policy. These guidelines are the origin of all government initiatives that seek to fulfill

migration to FLOSS. These articles can be categorized in four groups: 1) training (Articles #5, #6, #8, #9, and #10); 2) awareness and social aspects (Articles #8 and #13); 3) industrial stimulus (Articles #6 and #9); and 4) practical migration (Articles #7, #10, #11, #12, and #14).

5.2. Intended consequences of Decree 3,390

In the preamble of Decree 3,390 the government asserts some economic effects of FLOSS: The national software industry will fortify and increase its capacities. In addition, Article 6 of the Decree clearly states that the government will promote the development of the software industry by a network of technical training facilities. The argument for stimulating a sector of the economy by introducing an innovation in public settings cannot be categorized using the framework introduced in the literature review section.

The government acknowledges the existence of a technological and social gap in Venezuela and states that FLOSS will help to reduce this gap in a rapid and efficient manner. Decree 3,390 includes elements that will contribute to closing those technological and social gaps in Articles #8, #10, and #13. Article #8 outlines the role of the government in stimulating the use of FLOSS in society. Article #10 requests the introduction of FLOSS in the country's educational system. Finally, Article #13 provides advice for the protection of local cultures while accomplishing the migration process.

Closing social and technological gaps and stimulating the national software industry are intended consequences of Decree 3,390. Intended consequences are the outcomes that go beyond the immediate application of a policy, and can prove to be positive. The name comes from the literature that studies negative outcomes of policy applications, "unintended consequences." The government of Venezuela uses the intended consequences effect to justify the adoption of FLOSS in public settings. Intended consequences might also have political outcomes. If this is so, the administration will earn political credibility and support.[2]

6. Venezuela's migration initiatives

The variety of initiatives that Venezuela's government is pursuing to accomplish FLOSS migration is analogous to the range of reasons given as justification for the migration. Political reasons oriented to produce social changes direct the authorities' policies. For policy implementation, the government seems to maintain the same strategy.

The first change that the authorities had to accomplish relates to public employees' willingness to change to FLOSS. The authorities were aware of the size of the undertaking. The switch from proprietary software to FLOSS was greeted with reluctance by a mass of employees whose experience with computers involved only the proprietary software arena. Another factor that hindered migration was the rampant software piracy. According to the Business Software Alliance (BSA), Venezuela with an 86% piracy rate was in sixth place among countries with high piracy rates for 2008 (BSA, 2009). Given these circumstances, public employees' household computing experience was based on proprietary programs. Upon recognizing this situation, the government concentrated its first efforts on making public employees aware of the reasons for the change by going beyond the promotion of FLOSS. The government *proselytized*[3] this form of technology.

Proselytization activities created a link between FLOSS and the concepts proclaimed by the socialist doctrine. Terms such as freedom, equality, and independence are frequently descriptions of software developed under the FLOSS philosophy. Public employees' exposure to messages encompassed social inclusion and freedom of knowledge. Employees accepted the message that "knowledge must be free for the economic and social development of the people" (Subject #30). Conversely, proprietary software represented a tool for restricting knowledge acquisition.

The idea of national sovereignty, specifically in the technological area, was also repeatedly used. The

[2] This paper does not address potential unintended consequences of Venezuela's FLOSS migration.
[3] Proselytize: to persuade to do or join something (Webster's, 2001).

authorities used the devastating 2002 incident when the national oil company went on strike for political reasons as a major example. At that time, companies responsible for the systems that controlled the oil industry's processes refused to operate them. The government argued that the proprietary character of the systems' software made the recovery of the industry in a short time almost impossible, an explanation welcomed in a sector of public employees.

As a last resort, the authorities used a legal approach: The basis for migration to FLOSS is a legal instrument and must be enforced. This situation has created a general awareness in Venezuela's Public Administration of the obligation to switch to FLOSS. This, by itself, is an achievement in the migration process.

The proselytization activities denote the main strategy of the government: tying a technological object to a specific set of ideals. By selling the ideology, the policy makers were also selling the technology and vice versa. For some workers, the association works in a positive way and reinforced the policy, but in other cases the association generated negative reactions. Despite these ideological oppositions, the proselytization of FLOSS has had a considerable impact on public employees.

To accompany the social inclusion discourse, the government created academies to train Public Administration employees and people from the general population. The academies charge no fees for the education, and anybody with a high school diploma can attend (for some courses being literate is sufficient). These academies are not only training centers for the Public Administration, but also initial incubators for the new software industry.

Traditional business models in which large corporations consolidate most of the business, leaving little opportunity for domestic enterprises to compete, are being challenged. The CNTI, on behalf of the government, is intensely promoting small and medium enterprises to meet the demands of users. People trained in academies have found opportunities to establish companies with the help of the CNTI. The CNTI provides the administrative resources and, in some cases, economic support for these initiatives.

Proselytization, training, and boosting of new enterprises are activities not executed under a specific and detailed plan. The CNTI, FUNDACITEs, and CENDITEL are not the only organizations engaged in activities related to the government's strategies. Individual institutions also promote their own proselytization, training, and procurement of providers. This "organic" strategy has the indirect support of the government, and apparently resembles the grass roots character of FLOSS development.

The socialist ideology of the government blends with the organic and "bazaar" character of the FLOSS philosophy. Social inclusion and sovereignty are used as arguments to justify the switch to FLOSS, but no specific order exists through the Public Administration to fulfill the migration. The government is replicating, on a large scale, the process by which FLOSS was originally built: An ideological goal, pursued without an apparent structure, for a mass of people.

Some ideas go beyond the migration to FLOSS without any apparent organization from the government's side. All government initiatives work towards the same migration goal and rarely obstruct one another; even more in the worst cases, if there is some overlap thereare not negative consequences. Yet, despite the lack of centralized direction, the government has some legislative mechanisms that seek to enforce FLOSS adoption. A general policy, supporting implementation of FLOSS with a mandatory character is present, but at the practical level, execution occurs relatively voluntarily.

The bureaucracy, decentralized nature, and inertia of the Public Administration have contributed to a slowing of the course of the migration. As previously explained, Decree 3,390 does not have an extensive background; rather, it is a starting point that becomes confused as cause and consequence of the migration decision. The legislative character of Venezuela's FLOSS policies made possible the beginning of the shift towards FLOSS for the majority of public institutions, and the strategies that the

government implemented provides the fuel to maintain the process.

A political ideology made the Decree possible. The same ideology spreads it and is the basis for all related activities. In this situation, the disorganized form of adoption seems to replicate the plurality of the communities involved with FLOSS. The outcome of this process cannot be analyzed in the short term, and although five years have passed since the signing of the Decree, the process continues to evolve like any other FLOSS solution.

7. Building upon Gallivan's framework

Gallivan's (2001) framework is developed from an organizational level perspective. It focuses on employees adopting an innovation selected by an authority figure. The case applies perfectly to a typical private organization where the innovation has effects only within the boundaries of the organization, and then the change usually spreads in a coordinated fashion throughout the offices. In such a case, the introduction of innovation obeys a rationale related to maximization of returns and efficiency. Although external elements also influence decision making, organizations do not usually try to change those elements; they simply comply with them. For private organizations, the main reason for introducing innovation is to improve the organization's infrastructure, not to change the organization's surroundings.

When a government introduces an innovation in Public Administration, it is not only the government side that is affected. This is particularly true in the case of Venezuela. The country comprises a large and complex conglomerate of institutions, so innovation adoption is not a neatly defined process. In addition, the government seeks to influence conditions external to the Public Administration, including the development of a national software sector, and the "socialization" of knowledge.

To represent the Venezuelan's government reasons for and its way of carrying out the migration set out in Decree 3,390, Gallivan's framework requires modification. From the original framework, two stages of innovation adoption remain: 1) primary innovation adoption process, and 2) secondary innovation adoption process. The goals of the country and the availability of technology frame the primary innovation adoption processes. In addition, a third element plays an important role: politics. All three factors complement a process that precedes the primary adoption and have a dynamic character: they influence the other stages and are in turn influenced by them. This study refers to this recurrent process as the PTG cycle (Political, Technology, and Goals).

Primary adoption remains the first pragmatic step in the whole adoption process. In Venezuela's case, the primary adoption is the mandatory order to adopt FLOSS from Decree 3,390. The PTG cycle, the primary adoption and other factors (other influences in the original Gallivan's framework) are the elements that influence the secondary adoption process.

Another peculiarity of this case is that factors are not static. The PTG cycle and the primary and secondary innovation adoption processes seek to change some of the external factors. A representation of Venezuela's FLOSS adoption process appears in Figure 2.

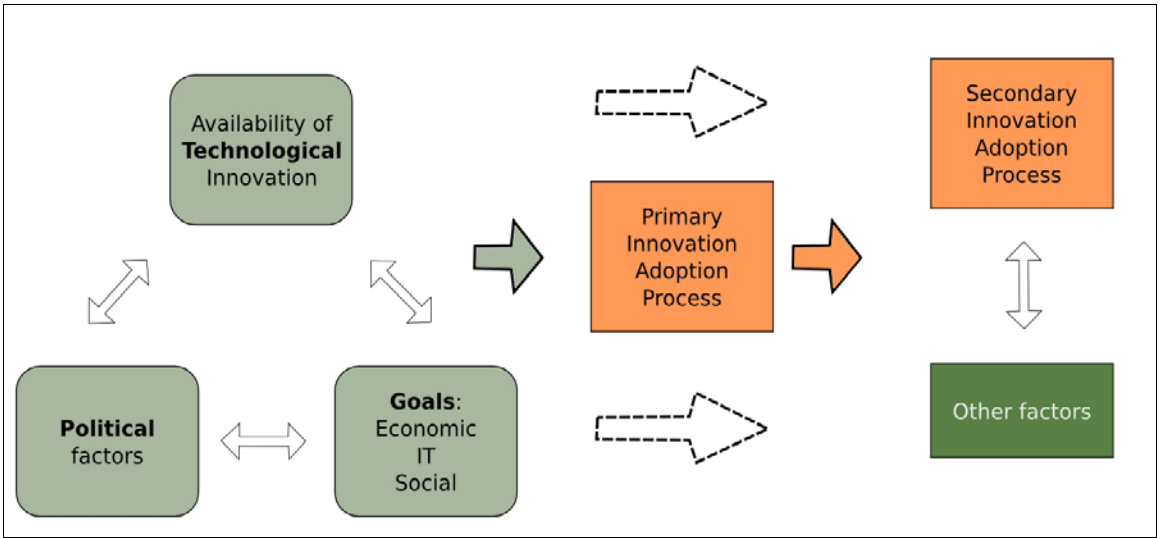

Figure 2: Representation of Venezuela's FLOSS adoption process

7.1. The PTG cycle

Decree 3,390 is the product of the three PTG elements: 1) political factors, 2) goals that the government seeks to achieve, and 3) the availability of FLOSS technology. The interaction of these aspects made Decree 3,390 possible; furthermore, they continually influence the secondary migration processes and also the external factors. Since Decree 3,390 is legislation, it is static; it does not have the ability to evolve with the secondary adoption processes. The PTG cycle plays the role of stimulating and creating the best circumstances for the rest of the adoption process to take place.

7.1.1. Political factors

The political component of the Venezuelan FLOSS migration is considerable. Subject #20 explicitly said, "Starting with the legislation, Decree 3,390. I think that makes sense because this government comes with an ideological approach where Software Libre fits perfectly."

The Venezuelan authorities found in FLOSS a perfect technological innovation to support and disseminate their political ideology. FLOSS is one of the technological fronts through which the Venezuelan government promotes its agenda. In one of CENDITEL's publications, the authors describe how, according to them, the Software Libre situation is part of the confrontation with neo-liberal ideologies:

> But the entire neo-liberal offensive is experiencing resistance from some sectors (especially popular ones) of the people of some nations (particularly Latin America). Within this resistance, one of the trenches in which a global battle is being fought is the Software Libre one; the dominant sectors try to disguise his battle as a purely technological one – sometimes with an economic aspect – but that is a manipulation of the truth. The fight around Software Libre is part of a bigger war: that of Free Knowledge.
>
> (Mendialdua et al., 2007)

No method exists to measure how relevant Venezuela's government ideology was prior to FLOSS policies being adopted. Nevertheless, the ideological component is always present in initiatives related to FLOSS migration.

7.1.2. Goals

Scholars have described two specific goals related to the introduction of innovation in government

settings (Feller, 1980). Authorities seek to: (1) increase the efficiency of the Public Administration by means of interoperability, and (2) increase the production efficiency of the Public Administration by reducing costs. In addition to these two reasons, this study found that Venezuela's government discourse included the "intended consequences" of its policies: (1) to close technological gaps, (2) to fortify the national software industry, (3) to achieve technological independence and autonomy, and (4) to enhance sovereignty.

Intended consequences go beyond the immediate application of the policy and influence other aspects of the country. As such, they represent National Goals. Goals related mainly to Public Administration are called Public Administration Goals. Table 3 describes the goals of Venezuelan FLOSS policies.

Table 3: Goals of Venezuela's FLOSS Policies

Aspect	Public Administration Goals	National Goals (Intended Consequences)
Economic	Increase production efficiency by reducing costs	Fortify the national software industry
		Achieve technological independence and autonomy
Information Management	Increase production efficiency by means of interoperability	Enhance sovereignty
Social		Close technological gaps

In the economic aspect, the Public Administration goal of Venezuelan FLOSS policies is to increase productivity by reducing costs. The government is aware that savings for the Treasury cannot be expected in the short term, but they could be considerable in the future.

> *I am convinced that there will be savings in the long term. In the short term, maybe higher costs than using proprietary software.*
> *(Subject #5)*

> *For example you see that EDELCA [a Venezuelan electricity provider] and other companies have part of their platform migrated. Systems whose licenses were over $30 million; licenses with exorbitant prices. You see how they have been adopting Software Libre and saved that money.*
> *(Subject #10)*

Subjects from the Public Administration also mentioned the cost reducing impact that FLOSS could have on the basic economic activity of the country: the oil industry.

> *Take the oil sector, a strong sector in our country, where their proprietary software focused on the exploration of oil wells from a geological point of view. Those systems could cost hundreds of thousands for a single license. Imagine that Venezuela generates a Software Libre solution, similar or superior to the proprietary one. Then, that would be an interesting input to the international community of Software Libre.*
> *(Subject #26)*

For the information management aspect, Venezuela's FLOSS policies seek to increase production efficiency by unifying the acquisition of IT and the interoperability of systems. The same subject

described the disorganization of the national Public Administration IT and how the CNTI is working to resolve the situation.

> *The actual situation is that the state buys the same application multiple times; it is not bought just once. Then, there are some people that have citizens' services in a way that is not compatible with other institutions that also have citizens' services. The CNTI plays that role. It organizes the acquisition topic as a country, within the limits of the State. That did not exist before; everybody was independent in the technological aspect.*
> *(Subject #26)*

Although these goals could be enough for the Venezuelan government to justify FLOSS migration, other goals go beyond the Public Administration. These National Goals can also be categorized by their economic and information management aspects, and they include a third aspect: social.

In the economic aspect, Venezuelan FLOSS policies have as National Goals to develop the national software sector and achieve technological independence and sovereignty. One of the first particularities of the Venezuelan approach is that the introduction of FLOSS in the government as a mandatory directive is an opportunity to develop a sector of the economy.

The Venezuelan Government is aware that companies following traditional business models of the software sector would be reluctant to develop and support FLOSS solutions. Subject 2 clearly explains the business model that the Venezuelan government prefers.

> *You know that there is the myth that Software Libre is free. Then, several companies have contacted us. They said, "Now, what am I going to do? I have a developing company, and now the software is free." Software Libre is free. But its sustainability, maintenance, and development are not. We are not pretending that they are going to be free. When you developed with the traditional model, the percentage of licensing was small. It was like 5% or 7%, which went to transnational companies. The part of development, when you developed software under a proprietary model, was the resources or fees that the company proposed (in some cases, a Venezuelan company). That part was because of operating expenses and profit. That model does not change. In other words, the person will keep evaluating or defining his/her operating costs and it was going to put a price on his/her software; to his/her development. The cost that will not be there is the license.*
> *(Subject #2)*

Companies are not only operating under a new model, but the Venezuelan state is also seeking to stimulate small and medium-sized companies in order to break software monopolies.

> *Obviously, there is a policy of the state to give priority to small and medium-sized companies, as well as new productive units of a social character (such as cooperatives, companies of social production, etc.). We are interested in promoting and giving priority to these types of productive units over other big companies. That does not mean that they [big companies] are excluded, but that the policies of the State are oriented to stimulate these new association forms.*
> *(Subject #5)*

The new software sector that the Venezuelan policies seek to develop has a business model far different from the licensing model of the proprietary software market. The government is open to including big companies among its providers, but it is also clearly strongly encouraging small and medium-sized enterprises. This bias is also a way to diminish the influence of foreigners in the technological development of the country.

The other economic aspect of the National Goals of Venezuela's policies closely relates to information management. An interest remains in increasing the country's independence of international technology. This would function in two ways by: 1) diminishing capital flight due to

technological purchases, and 2) enhancing the country's sovereignty. Traditionally the government made large software purchases from international providers (with a local presence); therefore part of the invested money left the country. As explained earlier by Subject #10, this situation could change with FLOSS introduction.

Technological independence and sovereignty goals, according to some of the subjects, have a significance that goes beyond economic aspects.

> *Effectively, there will be a time with cost savings. But that is not the state's main reason. Although more expensive, sovereignty and technological independence are not matters of money. There is no point putting a price on them. As the ads says: They are priceless. And this cannot be negotiated.*
> *(Subject #5)*

The social component is also introduced on a national scale. For the government, the paradigm change from FLOSS migration will contribute to a paradigm change in the way society in general accesses knowledge. Decree 3,390 mentions the technological gap in the country. As Subject #5 said:

> *(And additionally), there are elements that have to do with knowledge appropriation through this software [libre] and the development of national capabilities. We believe that Software Libre is the best and most efficient way of diminishing what has been called the technological gap or knowledge gap (especially in information technologies) that exists in developed countries and countries like ours.*
> *(Subject #5)*

7.1.3. Availability of new technologies

The maturity level of FLOSS has been discussed before (see Wheeler, 2007). FLOSS is now mature enough to be used for private enterprises in their regular businesses, and apparently this is the same case for governments. Subject #7 gave a description of the development of the FLOSS movement and why, according to him, it is the best choice for the Venezuelan government.

> *Technologically speaking, Software Libre is fairly recognized around the world; it has a value that obviously economic factors have tried to hide. It does not have a publicity component, and publicity is important. That is one of the biggest advantages of proprietary software. But those who deal with these technologies and get deeper in the topic have figured out that Software Libre is technologically mature. It is not a perfect technology. I have listened to comments that one is a better or worse technology than the other one. Neither of the technological models is perfect. Both have technological weaknesses and strengths. Nevertheless, from a political and strategic approach, there is no doubt that going for Software Libre is the best decision. Then, we have to see it as a country and evaluate all the elements: technical ones and political ones. Then, when you put together everything, you figure out that [Software Libre] is the right path.*
> *(Subject #7)*

Although some of the public employees interviewed for this study mentioned the technological benefits of using FLOSS, the ideological component seems to be always present in their understanding of the Venezuelan government's reasons for migrating to FLOSS.

7.2 Primary adoption process

The primary adoption process was the crafting and passing of Decree 3,390. Following the PTG cycle, the government made the decision to support the adoption of FLOSS in the Public Administration. The approach of Venezuela's government was radical, because adoption of FLOSS in Venezuela's Public Administration has a mandatory character, supported by a legislative mechanism.

The Decree defines the features of what the Venezuelan government will consider to be FLOSS and also indicates the measures that the Public Administration should execute to proceed with the migration. This first step initiated all the secondary processes occurring in the Public Administration, and interacted with other factors.

7.3. Other factors

Once Decree 3,390 was signed, several factors from outside and inside the Public Administration needed to be taken into account before and during the secondary adoption processes. From inside the Public Administration, factors related to normal operation of public offices, which related to individuals' willingness to adopt FLOSS. From outside of the Public Administration, factors related to the existence of mechanisms that can support a massive migration to FLOSS.

In relation to factors outside the Public Administration, the government of Venezuela is taking advantage of the opportunity to boost the development of a national software sector. This is one of the differences between the approaches of a private and a public organization when introducing an innovation. The public sector, the Venezuelan government in this case, is looking forward to changing conditions on a greater scale (a national scale). Although private organizations introducing technological innovations could also have this effect, usually it is a collateral effect.

The external factors in the Venezuelan case were considerations during the crafting of Decree 3,390, and the course of action of the government is continually affected by the PTG cycle. Next in the discussion of the external factors of Venezuela's FLOSS migration are the categories 1) external factors from inside the Public Administration, and 2) external factors from outside the Public Administration.

7.3.1. Factors from inside the Public Administration

The first and most important factor affecting Venezuelan FLOSS migration has to do with the organization of the State. Venezuela's Public Administration, legislatively speaking, is centralized, but a relative independence exists in the main government institutions and ministries. Therefore, accomplishing a coordinated and massive migration is an almost impossible task. Although Decree 3,390 makes the use of FLOSS in the Public Administration mandatory, no mechanisms exist to enforce the legislation. Therefore, each secondary adoption process becomes a new full adoption process in which authorities of that particular institution have to decide to participate in the migration (this will be expanded on later, when discussing the secondary adoption processes). The principal external factor within the Public Administration is the willingness of the authorities to commit their institutions to the migration. One of the subjects noted:

> *The migration to Software Libre is not a technical matter, it is a political one. A country's migration to Software Libre is not a technical issue. There are no technical issues. It is about political will and knowledge; a lot of political will.*
> *(Subject #2)*

The government's decision, expressed in Decree 3,390, was not directly transferred to the authorities of the rest of the Public Administration. The independence of these offices and the lack of a system to ensure compliance with FLOSS legislation have created a situation in which authorities of the Public Administration have become barriers to the migration process.

> *I think that this is the most important thing for a migration: a strong line from the top; to assure the migration.*
> *(Subject #5)*

> *People and top managers. Yes, that is the principal barrier because if your boss asks you to do something, you end up doing it. It does not matter if you complain. If you win the high levels of decision makers, maybe the migration will be a success, otherwise not.*
> *(Subject #17)*

The simple explanation of this situation is in Decree 3,390. Decree 3,390 acts as a legislative tool to force the adoption of FLOSS, but since it lacks punitive or rewarding mechanisms for implementation, the institutions respond in different ways. One of the subjects described the problem:

> *We have a punitive culture. Someone told me: "The problem is that it [the government] has not implemented correctives to Public Administration, so they move. We should talk with the SENIAT [Venezuelan Revenue-related institution], so it can do something." Then, with that culture of crime and punishment that we have, we are not going to solve anything.*
> *(Subject #23)*

Some explanations mitigate the authorities' reluctance. Authorities are under public scrutiny and their institutions' results become performance evaluations. But no measure exists for evaluating the migration of an institution to FLOSS. For example, the Ministry of Health is evaluated by the way the state's hospitals operate, not by the operating systems used on its computers. If the director, manager, or Minister are afraid of an interruption in or alteration of normal operating efficiency, reluctance to proceed with migration or even postponing it will result.

The size of institutions contributes to authorities' apprehension about proceeding with migration:

> *There are institutions that easily migrate. FUNDACITE Merida is a small institution, with fewer than 50 people, including people on internships. Therefore to go through a direct order [migration] is easy, and you can see results in a short time. But in a Ministry where you have hundreds, thousands of employees, thousands of computers and that kind of stuff… imagine PDVSA [the state-owned oil company], which has dozens of thousands of employees and computers. In addition it has systems that work under critical conditions. You cannot stop a system without the right control and that kind of thing. There are many things that make it [the migration] hard.*
> *(Subject #24)*

The introduction of a new technology by itself brings uncertainty for any authority position, but in the case of migration to FLOSS it is heightened. The introduction of FLOSS also brings the introduction of new business models and the need for qualified professionals. Authorities of the Public Administration are afraid of disruptions to regular activities due to a lack of support.

> *I need an infrastructure. I am not going to risk my work; I am not going to risk the institution's stability, because the support is not reliable.*
> *(Subject #2)*

Subjects compare prior experience with technical support with the unreliability of new FLOSS-related technicians. The subjects feel secure using proprietary software, trusting that with a simple call they can access technical support.

> *[Proprietary software] is something that you install, and you don't worry anymore about it. Then, if you have a problem you call the provider and that's it. I think that it is something that is rooted in Public Administration. This [the software] should not fail, and in that case I call a guy. Then I fight with the provider because he does not come quickly or is charging too much. I [the user] often complain but I always have someone to call.*
> *(Subject #25)*

In addition to technical support, difficulties also include formats and compatibility. The issues related to formats appear when public workers compare documents and other forms of printed material (tables, presentations, spreadsheets, etc.). The Public Administration has strict rules for the appearance of documents, especially documents related to financial matters. Since not all the offices have migrated, some offices have encountered problems creating and sending documents in open formats. Although FLOSS has complete word processor and spreadsheet solutions, sometimes making documents look similar to those created with proprietary solutions is difficult. The issue relates

to the presentation of tables and text and their distribution. Subjects also reported printing issues.

> *The technical support guy must hate us. Because we never get a format in the way it should be. It comes half of it, or it leaves a column out here or there. You can see it in "page preview" and it is perfect. But you print it and it becomes distorted. Or only half of the sheet printed. If you printed from a Windows machine, it printed just fine.*
> *(Subject #15)*

The subjects also complained about the lack of standards among Public Administration offices. Public employees from migrated offices highlighted the lack of enforcement of FLOSS policies.

> *Everything that the Minister asks for must come in Excel. I have never received a FLOSS file from the Minister. (…). Even when we send them, they simply said that the files cannot be opened.*
> *(Subject #15)*

> *How do you tell someone "work with Linux," if the same person received a call from Caracas [the capital] saying that they couldn't open the file, and the anti-virus said that the file has a virus. Or when their boss is saying that he/she does not know what that is.*
> *(Subject #10)*

People in migrated offices use FLOSS, but when exchanging documents with other public offices they are forced to use proprietary formats.

7.3.2. Factors from outside the Public Administration

The most important factor influencing Venezuela's FLOSS migration from outside the Public Administration is the lack of service providers. There is not a well-formed software sector that can undergo the challenges of the migration. On the other hand, large firms interested in providing support to the Venezuelan government abound, but the government is interested in creating opportunities for small- and medium-sized enterprises. The government's policies focus on building a skilled workforce and providing the resources for them to become entrepreneurs in the FLOSS sector.

A political component plays a role in the migration. The government's ideology closely relates to the migration, and in some cases the migration has been exposed as a political move.

One of the subjects described the situation:

> *[The migration] is hard. I also think is because of the political situation of the country. Because the people sometimes relate Software Libre with Chávez and his revolution. Then, some people become reluctant.*
> *(Subject #9)*

When the public associates FLOSS with the socialism that the government espouses, the results are mixed. People who agree with the government's ideology can find FLOSS appealing, and people who do not share the government's line of thought may reject FLOSS solutions. In both cases FLOSS is evaluated without considering its attributes because of the political inclinations of the people behind the migration proposal.

7.4. Secondary innovation processes

Gallivan's (2001) framework falls short in describing the adoption of FLOSS in Venezuela's Public Administration. The reasons include the structure of the Venezuelan state and the crafting of Decree 3,390. The structure of the Venezuelan government is decentralized: Each branch of the government receives its own budget and completes individual projects, sometimes in coordination with other branches. Conversely, Decree 3,390 does not provide any mechanism to enforce mandatory

adoption.

These two aspects of the Venezuelan adoption process force each institution to take the migration into its own hands. What happens is that the entire adoption process begins again, but on a smaller scale. The whole campaign that the government executed and Decree 3,390 itself are the elements that persuade authorities in each institution to initiate migration. Then, a process of adoption described using Gallivan's framework begins: a primary adoption process in which authorities make the decision for adoption, and a secondary adoption stage in which migration takes place.

Therefore, the representation of FLOSS adoption in Venezuela's Public Administration has a "recursive" character. The secondary innovation adoption process becomes a process by itself, with the authorities of the institutions going through similar stages to the process described by Gallivan. The new process, described in this study as the Institutional Adoption Process, also has two stages: 1) the institutional primary innovation adoption process, and 2) the institutional secondary innovation adoption process. "Institutional" highlights the fact that these events take place after the signing of Decree 3,390, at the institutional level of government.

In this case, two external factors affect the primary decision process: government pressure and the availability of infrastructure to support the migration process. Figure 3 is a representation of the Institutional Adoption Process framework.

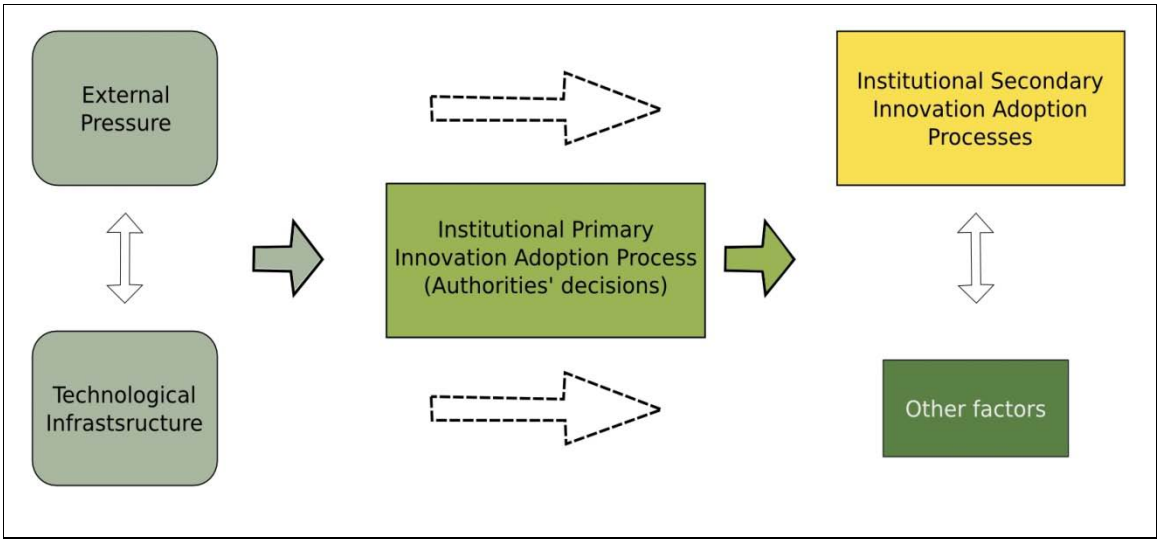

Figure 3: Institutional Adoption Process

Two new elements, government pressure and technological infrastructure, affect the decision making process of the authorities of each institution. Since Decree 3,390 is already law, the only remaining matter is when to implement the migration. The government has aggressively campaigned in support of the adoption legislation, but in the end, the decision for migrating must come from the authorities in each Ministry and government institution.

Directors and managers also have concerns about the availability of the technological infrastructure needed to mitigate change and about the disruption of regular activities which influence evaluations of their success in conducting the normal operations of their institutions.

> *The operation of the institutions must be guaranteed. In other words, you cannot take out a system and put Software Libre just because. And, we must avoid that any unit's operation gets interrupted.*
> *(Subject #30)*

Government pressure is the element with greater weight. Decree 3,390 is one of the first elements that subjects mention as a reason to migrate. Nevertheless, subjects make clear that non-migrated institutions exist because high levels of government have not insisted.

> *I think that the government is lacking something. I think that the government's effort is not enough for this [migration]. I say that because otherwise the whole Ministry of Science and Technology would be working with Linux.*
> *(Subject #10)*

Once the authorities have made the decision, the institutional primary innovation adoption process begins, and the institutions initiate the migration to FLOSS. This institutional secondary innovation adoption process is not unique. Each government body or institution completes the migration on its own terms. The interviewed subjects described a broad range of migration states in the Public Administration. Some institutions have not initiated migration; some have migrated major services (i.e. mail servers, firewalls, etc.), and some have even migrated desktops and workstations. Apparently, those institutions that have almost totally migrated are small to medium-sized institutions.

In the case of the institutional innovation adoption process, the "other factors" are not affected directly by the decision of the authorities. However, the institutional secondary adoption process has a continuing role as in the original framework. Initiatives of the public institutions to fulfill Decree 3,390 create possibilities for the creation of more companies.

The institutional secondary adoption processes are sometimes not the last link in the migration process. Usually ministries have several dependencies which, although linked to them by their budgets, work independently both managerially and geographically. For example, a particular school depends on the Ministry of Education, but the school's computers are independent of the Ministry's IT department. These dependencies could go through a FLOSS adoption process by a Ministry decision, or they can migrate by themselves.

8. Discussion

The use of Gallivan's (2001) framework makes it possible to identify the steps in the Venezuelan FLOSS adoption process and the elements that influence it. The first expansion of the framework included a necessary political-technology-ideological (PTG) component arising from Venezuela's endogenous development and socialist approach which are the unifying ideologies behind the FLOSS migration process (Figure 2). The second expansion facilitates the analysis of adoption processes that take place inside the structure of the Public Administration (Figure 3).

The migration initiatives are fueled by the Venezuelan authorities' ideologies. Proselytizing activities, one of the main strategies, often defined the adoption of FLOSS in terms of sovereignty and nationalism. The government's discourse describes the use of proprietary software negatively by relating it to capitalism and colonialism, and FLOSS becomes a tool for increasing people's access to knowledge. The notion of social inclusion is a recurrent government strategy.

Training activities, another of the FLOSS migration strategies, focus on overlooked sectors of the population. The government offers free courses on FLOSS solutions to Public Administration employees and citizens in general. The CNTI also seeks to foster the development of small and medium-sized enterprises that will provide services and products to the Public Administration. In this way, the government pursues the formation of productive units, independent of international corporations.

While the ideology of the government contributes to migration support and promotion, the same ideology sometimes acts as a deterrent to FLOSS adoption. Public employees supporting FLOSS are usually accepted as supporters of the government. Therefore, Public Administration employees who are detractors of the government's position apparently oppose FLOSS adoption only for political

reasons. Given the political polarization of the country, and since most institutions are controlled by the president's followers, the use of the president's ideology to support the adoption of FLOSS in the Public Administration seems an appropriate strategy. Nevertheless, the debate surrounding the validity of using political power to introduce a technology remains.

Moreover, the factors that generated Venezuela's FLOSS legislation also influence the unsystematic adoption of FLOSS. The weight of the political ideology behind FLOSS adoption plays a critical role. Authorities at different levels find that not only does FLOSS migration have a legislative mandatory character, but also that the pressure from the authorities has associated FLOSS with the socialist philosophy that the government promotes. This situation is depicted in the institutional adoption process (Figure 3).

The analysis of Venezuela's FLOSS adoption process reveals the recursive character of the migration. The multiple nodes of Public Administration and their independent character force the creation of new decision-making stages. Authorities at different levels of power engage in evaluation activities to decide when and how to proceed with the adoption. Decisions can range from promoting full migration to simply doing nothing. As a consequence, the adoption of FLOSS in the Public Administration has not been uniform.

Ideas of sovereignty and promoting the national software sector are elements influencing authorities' resolutions at middle and low levels of power. In addition, the availability of a technological infrastructure for support is a factor that shapes authorities' decisions. The three elements of the PTG cycle (political factors, technological infrastructure, and government goals) that gave form to the primary adoption process continue to play significant roles.

The apparently disorganized character of Venezuela's FLOSS adoption also has positive consequences. Since Decree 3,390 delegated the planning and completion of adoption, institutions and agencies of the government are responsible for their own adoption processes. Therefore, adoption can begin from the bottom in small dependencies of the Public Administration. These migration experiences have contributed to the generation of better FLOSS adoption procedures for the rest of the Public Administration.

While the mandatory character and other forces (the PTG cycle) attempt to enforce the adoption of FLOSS from top to bottom, some migration initiatives take place from bottom to top. These isolated initiatives confirm that the philosophy behind the creation of FLOSS solutions manifests itself in Venezuela's FLOSS adoption.

9. Conclusion

While FLOSS is being embraced by the private sector worldwide, governments have been slow to follow. Interestingly, open forms of technology have the peculiarity of being compatible with socialist principles, and, at the same time, are byproducts of the information age. Venezuela's approaches to ICT policies, specifically as they relate to FLOSS, have focused on promoting ICT initiatives in the public sector. These initiatives have been stimulated not only with rhetoric and discourses published in strategic plan documents, but also with the creation of laws that give legal authority to the policies. Four years after the launch of Venezuela's FLOSS migration, the phenomenon is still evolving. That said, however, some lessons are emerging from this process.

The research question that drives this study is *How have Venezuela's FLOSS policies been implemented?* This study found that the political ideologies of Venezuela's authorities clearly influence the decision making and implementation process of the country's FLOSS migration process. This influence manifests itself in the discourse used in Venezuela's FLOSS legislation and the initiatives that the government executes to implement the adoption of FLOSS. Basically, the government has three main strategies to accomplish this task: proselytization, training, and stimulation of the software sector.

This study builds upon Gallivan's (2001) framework, which describes mandatory technological adoption in organizations. The framework elucidates the process by separating the decision making process from the stage of practical adoption. This two-step representation of adoption is also useful to separate the elements that influence the two stages. The primary adoption process – related to decision making– is influenced by the authorities' objectives and the availability of the technology. Once the decision is made, the secondary stage – implementation – is influenced by primary and other factors inherent to the adoption.

In the case of Venezuela, and for the purposes of this study, Gallivan's framework was expanded. In addition to the authorities' goals and the availability of technology, a third political factor influences adoption. These three factors influence the primary adoption process, Decree 3,390, and also the secondary adoption process or implementation.

Venezuela's secondary adoption process is not a single event. The stage becomes a copy of Gallivan's framework which takes place on a smaller scale. This recursive situation can repeat itself until a final secondary adoption stage emerges where the physical and actual migration to FLOSS occurs.

The two additions to Gallivan's framework contribute to understanding political pressure and bureaucracy in innovation adoption processes. The permanent role of a specific political ideology is evident in Venezuela's FLOSS adoption process. Notwithstanding this, the bureaucratic obstacles and the government's decentralized structure make the innovation adoption process repeatable at different levels.

The new theoretical constructions introduced in this study can help the Venezuelan authorities to self-evaluate the migration process, taking into account the factors of the PTG process and the two forces that play a role in secondary adoptions. The expanded Gallivan's framework also can be used in other countries undertaking a technological adoption. The United Kingdom (UK) might be a good candidate. The country is also pursuing a migration to FLOSS with a non-legislative, near mandatory character. The UK FLOSS policies make little reference to ideological support for the migration, but make clear the technological advantages of it.

Finally, the IS research community needs to pay close attention to how FLOSS is implemented in public settings. Approaches taken by governments today may influence the software industry in the future and open up the possibility of new ways to procure information-based goods for their citizens.

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List of acronyms

CNTI: Centro Nacional de Tecnologías de la Información. (National Center for Information Technologies). An institution linked to the Ministry of Telecommunications and Informatics. CNTI acts as a consulting institution for the FLOSS migration requirements of the rest of the Public Administration.

CENDITEL: Centro Nacional de Desarrollo e Investigación en Tecnologías Libres. (National Center for Research and Development of Free Technologies). An institution linked to the Ministry of Science and Technology. CENDITEL promotes projects related to free technologies (as in freedom), including software and hardware. The institution also takes a humanistic approach to its studies.

FUNDACITE: Fundación para el Desarrollo de la Ciencia y la Tecnología. (Foundations for the development of Science and Technology). Institutions of regional character whose principal objective is to match regional needs with scientific or technological solutions. They act as regional sponsors for ASLs and FSLs.

MCT: Ministerio de Ciencia y Tecnología (Ministry of Science and Technology).

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Edgar Maldonado received his PhD from the College of Information Sciences and Technology at the Pennsylvania State University. Currently, he is a Mentor in the School of Business and Technology Management at Northcentral University. His research focuses on understanding how the development and use of open source technologies can positively impact both the public and private sectors. He is also interested in the development and formulation of standards and licenses for the distribution and modification of digital content. While at Penn State, Edgar served as Senior Student on a National Science Foundation funded project seeking to understand the use of information and communications technologies by humanitarian relief organizations delivering services and goods in times of emergency and disaster. Edgar has an undergraduate degree in Electronic Engineering from Universidad Simón Bolívar, Caracas Venezuela. Before entering graduate school, he worked as a software support engineer for banking networks.