

IT policies for development: A framework to analyze Open Source Initiatives in the Bolivarian Republic of Venezuela

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Abstract

In recent years the concepts of economic development and technological advancement have become so intertwined that they have in many cases come to mean the same thing. For countries seeking economic development through engagement with the Information Economy, policies supporting technological development claim privileged positions in national agendas. Often supporting this belief is the view that the most direct route to technological advancement is through full participation in the global information economy. However, for developing nations, full participation in this global information economy is at times impossible due to the developing nature of the nation in question, or seen as secondary to a desire to develop a national-level Information Economy rather than an international or multinational one. When participating in the global Information Economy is eschewed, few developing nations have the internal resources to create internal information economies, which support national information products, software, hardware and services.

The Bolivarian Republic of Venezuela, 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, 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, Venezuela has chosen to encourage, develop and support the use of Open Source (OS) software for all of its government agencies and affiliated partners. Building upon technology adoption and diffusion literature and Venezuelan policies, this paper develops a framework to analyze OS adoption by governments. The framework describes three factors: the *organizational factor* or the process of adoption per se in governmental offices, the *economical factor* or the reaction of the rest of the economic sector to the adoption, and the *innovative factor* or the process of developing workforce and OS technology.

1 Introduction

Most of the economy of the world is now based on strategies that engage knowledge as foundation of the development processes. Referred to by authors as knowledge economy, this form of market relies mainly on ideas and technology rather than physical abilities and transformation of raw materials (Chen & Dahlman 2005; World Bank 2003). The expansion of

new technologies and, especially, Information Technologies (IT) have facilitated the birth of this form of economy and have made that multinational firms embrace a global perspective on their business (Trauth 2001). However, firms have imposed an acknowledged deal to the IT departments: “On one hand, there is relentless pressure to cut costs; on the other, an unending demand for innovative solutions”(Golden 2005, xxi). Providers have direct control over these two aspects, so IT departments can only work with the limitations already given by the big developers. On the other hand, switching costs and scarcity of providers make companies to face lock-in (Shapiro & Varian 1999). The fact that by January of 2007, according to Net Applications, Microsoft’s solutions had more than 90% of the Operating Systems Market Share (Net Applications 2007) is an example of this issue.

Governments as any other organization heavily rely on computers, so they are also in the dilemma of cutting costs-innovative solutions. In addition, they are specially affected by the lock-in situation. Weber has used a metaphor to put this situation in perspective. He states that “[N]o national government, if it had alternatives, would have chosen during the 20th century to accept dependence for steel or petroleum on a single or small number of suppliers based in another nation”(Weber 2003, 18). Therefore, what countries can do so they do not depend from a small number of providers in the matters of IT, specifically in the software sector? It is clear that governments should promote a more diverse landscape in the software business to assure a smooth path to development. Open Source is not tied to providers and since the code is available is not sensible to national security issues, so it seems a promising solution to government concerns.

Open Source software, whose principal characteristic is that the code is released along with the executables, is a concept that came from the early computing developments in universities labs. This model of software has been successfully used in the private sector, and now it is jumping to the public sector. The form that OS systems have been taking the place of proprietary software indicates that the OS software movement is at the peak of popularity. Software resulted from the OS environment is competing with proprietary software, and they are proving themselves better in some cases than proprietary solutions (the Apache web server, Firefox, and others). Linux, a proven reliable operative system is used for embedded systems, servers, and desktops all around the world. In addition, companies are realizing the advantages of implementing OS solutions as part of their computational platform. The boom of OS can be

measured in the fact that IBM, HP, and Oracle, companies whose principal businesses have been traditionally based in the selling of proprietary software, have opened new lines of businesses that deal with training and support of Linux. The adoption of OS software in general has generated concerns, not only among those against it but also among the ones that support it. Arguing that the software industry has been successful mainly because of the business model that it follows, detractors of OS software find it a “dangerous fashion” without future. Supporters of Open Software believe that the future of the software industry is a mixture of proprietary software with a lot of OS. Using the contributions of other authors, we are among the supporters.

The implementation of OS projects is now also a current topic for legislators around the world. The Centre for Strategic and International Studies (CSIS) published a report with a summary of government policies towards the use of OS (CSIS 2006). The report shows that there are two hundred and sixty five OS policy initiatives. From those policies, Europe has 47.7%, Asia has 27.7%, Latin America has 15.2%, and North America has 6.4%.¹ The categories that used the CSIS document 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 OS mandatory in the public administration: Belgium and the Bolivarian Republic of Venezuela.

The Bolivarian Republic of Venezuela passed legislation (3.390 decree) that gives priority in all governmental systems to software developed under the OS definition. This legislation counts not only with political support, but with a great amount of revenues originated from the new oil boom. Capital is always needed for a massive shift from one technology to another. In particular, Venezuela is not only seeking a change in the software that public offices use, the legislation also provides a group of actions that contemplate the creation and nurturing of a new generation of IT workers.

2 Policy

To define policy we use Lowi’s description. A policy includes “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, 317). The subjects of policy making activities are “decision makers”. Codd emphasizes this characteristic, for him “policy is about the exercise of political

¹ The rest percentage is in other countries such Australia and New Zealand.

power and the language that is used to legitimate that process” (Codd 1988). However, policies are not static, “the question “what is policy?” should not mislead us into unexamined assumptions about policies as “things”; policies are also processes and outcomes” (Ball 1994, 15). These three authors provide the three main features of policies: (a) a policy comes from an entity that has some form of power, (b) policies manifest themselves in any form of output from those entities, and (c) policies are not static, they are embedded in processes or actions. In OS software adoption, governments are decision makers, decrees or laws are the output, and the pragmatic initiatives for adoption are the dynamic manifestations.

2.1 Development Policies

Assuming that governments created policy seeking the integral development of their citizens and country, I found it useful to provide a background of how the idea of development shapes policies of a country. This will provide a perspective of the circumstances around the decision of embracing OS. Development economics is an area of research that has been interested in the study of the strategies that countries of the Third World need to follow to solve their economic problems (Lal 1996). In this area, the basic premise for theorists is to observe the circumstances under which economic development takes place and identify the key variables of the process (Lal 1996). The Fisher and Clark theory of structural change (Clark 1940; A. G. B. Fisher 1939), the Lewis model of the dual economy (Lewis 1954, 1955), the Harrod-Domar model (Domar 1946; Harrod 1939, 1948, 1960), and the stages of economic development of Rostow (1960) are examples of theories that have used this approach to describe the process of development. Theories of economic development can be categorized into four groups by the elements they emphasize (Baldwin 1967):

1. The importance of foreign trade and official or private capital.
2. The role of an appropriate industrialization.
3. The significance of the reduction of inequality.
4. The role of the state in controlling the economy.

The last theories have lost some of the explanatory power since the introduction of new information technologies and, as a consequence, new products and forms of production. IT has

impacted economy and society. Since the 90's most of the planet is organized around computer networks, and "the entire realm of human activity depends on the power of information, in a sequential of technological innovation that accelerates its pace by month" (Castells 1999, 2). Castells also asserted how information and communication technologies are not sufficient but a necessary tool for economic development and material well-being of the countries (Castells 1999). This reality has made legislators in developing countries to begin consider the IT sector as a fundamental part of their policies.

Government policies towards ICTs fit among the four categories of economic development policies showed above. Some of the policies are focus in attracting investors and developing a national IT industry (categories 1 and 2). Other policies look at solutions to close the digital divide (category 3). Finally, some policies are only the summary of rules that the state imposes to all the IT players in the market (category 4). OS software adaptation policies also can be categorized in any of the four categories of economic development policies. James has suggested that OS software can alleviate the digital divide by reducing the price of technology (James 2001). Weber has explained how OS software could contribute to generate a national IT sector (Weber 2003). On the other hand, most of OS policies are a form of imposing new rules in the software sector.

However, in the specific case of the Bolivarian republic of Venezuela, the OS software adoption policies are strategies to stimulate an appropriate IT diversification under an inclusive strategy to reduce inequality. The police also include notions of national security and autonomy. Before getting to that part, it is necessary to elaborate in the definition of OS software and the position of the literature before governmental adoption of it.

3 What is Open Software?

3.1 Definition

OS software is software that in its distribution includes the source code along with the executable program, so anyone (with the knowledge to) is able to make changes to it. Now, not all open software is the same. Depending on the license, OS can make that any modification of it should still be open (General Public License, GPL), or can give more choices to any modification or distribution (non GPL). In this proposal, the definition of Open Software is the one given by the

OS Initiative. The OSI provides a list of ten characteristics that any software must have to be considered OS. The ten points can be summarized in three features:

- *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, 10)

3.2 OS and Industry

Since OS software principles go against some Intellectual Properties rights, it seems that the business model of charging for the use of a piece of software does not have sense anymore. The idea of giving away the code could be interpreted as “free” code. Nevertheless, companies have found forms of profit from OS products. The distribution, support and training for Open Software solutions are part of this new business model. The question could be, why a new business model? Is there something wrong with the old one? There is a line of research trying to answer the question if there is a market failure in the software industry or not (see Hahn 2002). Independently of this debate, the truth is that OS software has been taking market from proprietary software, and big companies are aware of that.

Nearly any IT organization has some interaction with a form of OS software (Weerawarana & Weeratunga 2004), even without knowing it. For example, by February 2007 more than 60 % of all web servers were running Apache, an OS based software (Netcraft 2007). Big firms whose principal business is the software development sector are taking advantage of the momentum of the OS 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 OS-related events and has initiated more

than 100 OS projects of its own (HP 2007). Oracle states that the company “is clearly embracing and offering OS solutions as a viable choice for development and deployment” (ORACLE 2007). Finally, Sun’s Java platform is OS.

On the other hand, IT managers have begun to study the ways of getting OS software as part of their firms’ platform. As result, several researchers have studied the OS phenomenon from an adoption perspective. The basic premise is that OS software should be evaluated with the same rigor that proprietary software, and that the fact that is “Open” should not be the base to take a decision over a proprietary solution, or in Madanmohan & De’ words “If the OS component offers the best solution and reliability for the price, then it’s the most appropriate” (Madanmohan & De' 2004, 66). Under Madanmohan & De’ premise, guidelines to adopt OS solution in firms have been published (see Fink 2003; Golden 2005). In those publications, authors suggest IT managers how to evaluate and select an OS solution and what the risks are for their organizations. Nevertheless, when the organization is a governmental body, authors not always offer advice for implementation of OS software.

3.3 OS 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, 1). Therefore, since the last 90s governments around the world began paying attention to OS software, and the authors have argued about how a country should redact its policy about OS software and its use. This part provides a summary of the form of adoption that governments have taken towards OS, and a categorization of the literature that analyze OS-related governmental policies.

OS has been a hot topic for researchers. The phenomenon of a group of people contributing to a project without any monetary rewards has appealed social and computer scientists, but the impact of the software per se in society has initiated a new line of research. The adoption of OS by governments has initiated a debate about the role of the states in direct government support to OS. The phenomenon is new, so researchers only can be critical of the forms of adoption or describe a specific case. Even more, there is not a significant quantitative

case that could provide evidence of success or failure of OS adoption by governments (Hahn 2002).

Authors have argued about how a country should create its policy about the OS software and its use. The literature that deals with these policies basically offers three types of advice. For easier reference throughout the rest of the paper, I labeled them as red, yellow and green approaches: (1) government should be neutral in the adoption of any form of technology (red), (2) governments “naturally” ought to choose OS given the benefits that this provides (yellow), (3) and governments should be actively involved and promote the adoption of open software (green).

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, 314)

The Yellow approach acknowledges the value of OS, but it considers that government should be carefully when intervening in the market. Lessig advices that the factors that determine efficiency for government are different from those that determine efficiency for the private sector because government is a institution that aims to benefit the most governmental actors including all its citizens (Lessig 2002, 64). Therefore, the choice of OS in one case could represent benefits for external players. The partial neutrality of the Yellow approach is shown in Lee advices: “The ultimate conclusion is that when two systems are equally suitable, governments may reasonable

choose OSS over proprietary software because software industry market failures may justify such support of OSS development” (Lee 2006, 48)

The Green approach has been getting adepts during the last four years, when the number of governmental projects of OS 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 OS contributes to solve the universal access problem; provides independence, local control and local economic growth; and improves transparency and democratic accountability. The pragmatic arguments are related with the interoperability, security and cost of OS software. Other authors see Open Software as a possibility for developing countries to reduce their IT investments and to break 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 OS:

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, 21)

The position of the Bolivarian Republic of Venezuela concurs with the green approach. The next section deals with the details of the Venezuelan policy towards OS software and provides the fundamentals to build the framework presented in the last part of the paper.

4 The Venezuelan Case

By 2004, when the government of the Bolivarian Republic of Venezuela passed the 3.390 decree, it also provided the guideline for the adoption of OS software in the public administration. The legislation not only clarified the reasons that caused the decree, but it stated the definition that will use the Minister of Science and Technology to carry out the project. From those definitions and their interpretations, the Venezuelan policies related to OS began getting their shape. The idea of new forms of generating technology is not an idea that the Venezuelan government

applies only to the development of software. A broader plan for the development of science and technology was planned along with the OS policies.

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 Cordova, 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).

Through examining Venezuela's policies, expressed in the NPSTI, it is clear that policymakers believe that in order for there to be an economic change there must be first a cultural change in science and technology in the country. 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 expose three main goals: (1) to achieve scientific and technological independence, (2) to promote science and technology oriented for social inclusion, and (3), to build national human resources.

The NPSTI reflects the policies that the nation should follow for the promotion of science and technology in order to change the old models that kept innovation as a tool only for privileged sectors of the population. The plan exposes how past governments have planned science and technology without taking into account social factors, and scientific and technological culture was fragmented, individualist, parceled, single-disciplinary-oriented, and linear. Taking a chronological approach, the NPSTI shows how past governments' notions of how to reach economic development contributed to shape those approaches to science and technology. The "substitution of importations" that was held from 1960 to 1980 looked to stimulated the innovation engine of the country, but the approach was a failure because universities and other institutes were not participants in the policy. From 1980 to 2000, a "neoliberal" economical model was in place. Free market and consumerism were the basic

guidelines of this model that increased the country's dependence on foreign products and technology and made greater than before the difference between poor and rich. In 2000, the economic approach of the currently administration "endogenous development" came with new social-oriented proposals (Ministerio de Ciencia y Tecnologia de Venezuela 2005).

According to NPSTI, endogenous development is an answer to wrong prior policies that overlook group of citizens in their guidelines. Using sovereignty and social inclusion as primary goals, this approach suggests using the competitive advantages of the nation and changing its consumer style. The NPSTI elaborated further, "[W]ithin this framework, terms such as profitability and individual gains lose their hegemony as major motivations for production, and the happiness and wealth of the whole nation take their place as principal incentives" (2005, 78). This does not mean that competition and free market do not have a place in the economy, but that the well-being of all sectors of the nation should be the cornerstone of any economic initiative.

The NPSTI summarizes the aspects of the endogenous approach in the following points: it takes into account national strengths, takes place inside the territory, works not only with extraction but transformation of natural resources, includes overlooked population, stimulates new forms of consuming, develops new forms of organization (productively and socially speaking), and encourages small and medium industries. Although, some of the factors seem to go against the globalization principle and open international markets, the NPSTI clarifies that "... 80% of the global production focuses in national markets, 95% of the investments comes from national funding, and nine out of ten workers work for national markets" (2005, 79). Therefore, national markets and local needs, major factor in the endogenous model, are still the essential engines of most economies in the world. Because the armed conflict in the Middle East and the growing of Asian economies, world's Oil demand has raised as long as the price of this limit resource. Venezuela has been one of the countries that have been benefited by the rising. Oil revenues and the socialist approach of the president Hugo Chavez Frias have created a permanently open "policy window". Kingdon has explained that public issues go to governmental debate and later to actions 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 OS initiative is part of the result of those changes.

4.1 OS Academies

An initiative in the Information Technology sector is one of the best exponents of the new approach. The decree 3.390 of 2004 ("Decree 3.390" 2004) calls for giving priority to open software systems in all governmental departments as a first choice. Proprietary software is only permitted in those cases where not OS based solution is available. With government investments, the Minister of Science and Technology has created regional institutions for the development of OS software called "OS Academies" (Ministerio de Ciencia y Tecnologia de Venezuela 2006). These institutions are developing OS software to be used in government dependencies without an information technology system (public hospitals, elementary schools, small tourism-related business, etc.). Academies follow a model similar to the use for the global OS 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 institutions that have assumed the nurture of the Academies are the *Fundacites*. A Fundacite is an institution 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: Anzoátegui, Aragua, Carabobo, Falcon, Guayana, Lara, Mérida, Sucre, Táchira, and Zulia. The Fundacite Mérida is the one has assumed the leadership in the development of OS solutions and training.

4.2 Fábrica de Software Libre - Fundacite Mérida

Fundacite Mérida is located in Mérida, the capital of the state with the same name, at the west-centre of Venezuela. It was created in 1989 as part of the Foundation for the Development of Science and Technology (Fundacite Mérida 2007b). Fundacite Mérida created the "Fábrica de Software Libre" (OS Factory) as an institute for the development of OS solutions for the government and for the support of the migration to Open Software that is taking place in the country (Fundacite Mérida 2007a). The OS Factory has already products being used, such as software for the administration of independent governmental offices called SAID (Sistema Administrativo Integrado para instituciones públicas Descentralizadas) (Fundacite Mérida 2007a).

5 Open Source Adoption in the Government Sector

To understand the process of adoption of OS software in governmental offices, it is useful to look prior research in the area of technology adoption. Kamal (2006) have summarized information technology adoption models in governmental settings. In his summary, he analyzes eleven theories studied, from the Change Model (Lewin 1952) to the Organization Innovation Adoption (Frambach & Schillewaert 2002), and all of them look at the process of adoption and diffusion of innovations focusing on the internal aspects of the adoption process. Kamal produces a comprehensive framework for the study of IT innovation adoption in the government sector. He proposes five topics: 1) perceived technology factors, 2) support, 3) external forces, 4) collaboration factors, and 5) organizational factors. Although the framework can be used to analyze the adoption of OS software by the government as organization, it assumes small influence of the adoption on the society outside the government.

The case of Open Source software adoption is different. The study of its adoption by the government using Kamal's approach could provide a better understanding of the process, but it will not give us more information about government additional intentions. In the Venezuelan case, the government looks to facilitate the creation of a domestic software sector, decrease the dependency to foreign technology, and to diminish the cost of access to IT. A framework that could help to better elucidate this process is the one proposed by Fisher and Wesolkowski (W. Fisher & Wesolkowski 1998). They identify who is impacted by the introduction of technology within an organizational point of view. An expanded version of their framework includes two other factors that play a role in the OS software adoption: the economical and the initiative factors. The framework is pictured in the Figure [1].

The framework is useful for identifying three factors of the OS adoption. First is the organizational factor or the adoption itself by governmental offices. This part includes all the procedures that the government as organization should implement to assure the success of the OS software adoption. The framework offers by Kamal turns out to be especially useful in that particular. Second is the economical factor or the respond of the private sector to OS government adoption. When a government adopts OS software, not only the software sector is affected, but the rest of the economical sector that in some way or other always is going to be affected. This topic is of special interest for economical literature. Third is the innovative factor or the initiatives that government funds, seeking to nurture an IT workforce and IT technology around

the Open Source model. In the specific case of the Bolivarian Republic of Venezuela, OS Academies and OS Factories join together to form the innovative factor of Venezuelan policies.

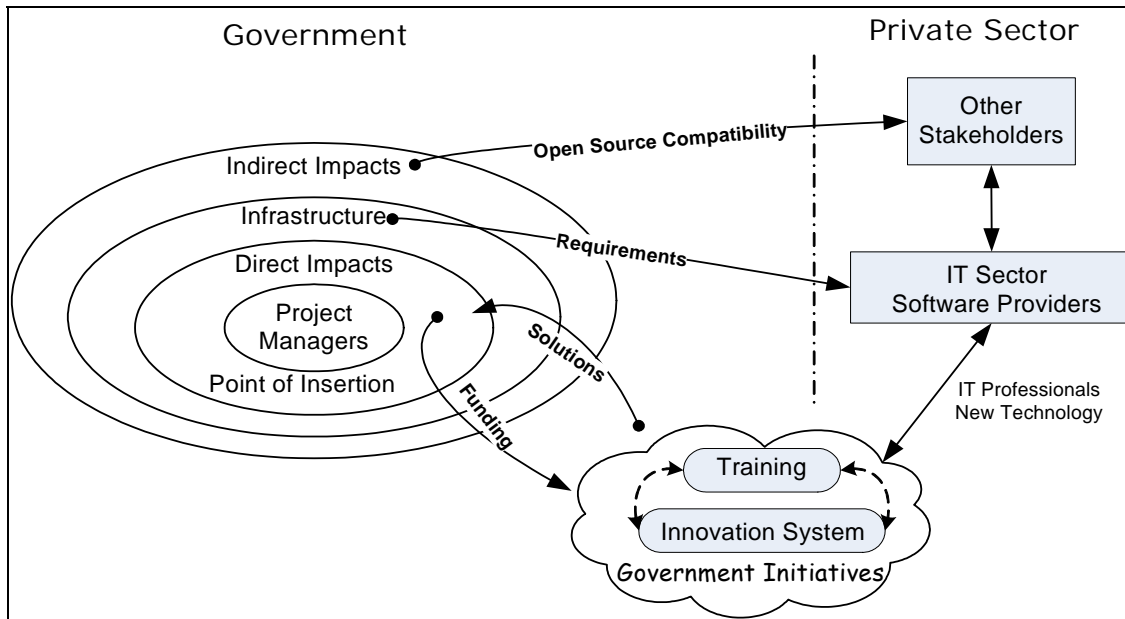


Figure 1. Who is impacted by the adoption of Open Source Software (expanded from (W. Fisher & Wesolkowski 1998)).

6 Conclusion

The study of OS software adoption in the government sector is an early stage. Although some governments are hoping that the introduction of this model of software production could bring benefits beyond the economical aspect, the effects of OS software adoption will depend on factors that are out of the government organizational perspective. The present paper introduced a framework that identifies three aspects that result fundamental in the planning of OS software adoption: the organizational factor, the economical factor, and the innovative factor. Using this framework as base, my future research will focus in the innovative factor in the OS policies developed by the Bolivarian republic of Venezuela.

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