



Free and Open Source Software

Approaches in Brazil and Argentina

Marko Mannila

Foreword by Tere Vadén and Niklas Vainio

Table of contents

FOREWORD	
Free software and open source software (FOSS) in the context of public policy	3
EXECUTIVE SUMMARY	5
1. INTRODUCTION	7
2. ENACTED TECHNOLOGY AND SOFTWARE CHOICE	8
2.1. Role of the state	9
2.2. IT policy making process	9
2.3. Software choice in Latin America	10
3. BRAZIL	11
3.1. Policy making process and IT	11
3.1.1. Formulation	11
3.1.2. Policy legitimating	11
3.1.3. Implementing	11
3.1.4. Finding the best alternative	12
3.2. Legislative activity and IT	12
3.3. Terms of public debate	13
3.3.1. Costs	13
3.3.2. Exports	13
3.3.3. Increasing access	13
3.3.4. Migration plan	14
3.4. Key challenges	14
3.4.1. Local development	14
3.4.2. Technical development	15
3.5. Local experience	15
3.6. Specific issues in Brazil	16
3.6.1. Competition	16
3.6.2. Language	17
3.6.3. Excessive bureaucracy	17
4. ARGENTINA	18
4.1. IT policy making	18
4.1.1. Formulation	18
4.1.2. Legitimating	18
4.1.3. Implementation	18
4.2. Legislative activity	19
4.3. Terms of public debate	19
4.3.1. Savings	19
4.3.2. Software market	20
4.3.3. Security	20
4.3.4. Fighting corruption	20
4.3.5. Migration costs	21
4.4. Key challenges	21
4.4.1. Access to information	21
4.4.2. Piracy	22
4.5. Local experience	22
4.6. Specific issues in Argentina	23
4.6.1. Privacy law	23
5. CONCLUSIONS	24
5.1. Brazil	24
5.2. Argentina	25
5.3. Governments and the enactment theory	25
REFERENCES	27
Interviews	27
Literature	27

Foreword

Free software and open source software (FOSS) in the context of public policy

¹ <http://www.gnu.org/>

The idea of free software, formulated in the GNU project¹ initiated by Richard M. Stallman, is to give the user the freedom to study, use, modify and redistribute the software without having to ask for permission from anybody else. A prerequisite for these freedoms is the access to the source code of the program (“open source”). The free software movement has since the 80s been creating free software for various purposes. The most famous example of free software may be the free operating system GNU/Linux, a set of free software with the Linux kernel as its core. Other well-known examples are the Mozilla and Firefox browsers, OpenOffice.org office package, and the MySQL database system. Network software like Apache, BIND and Sendmail currently form a remarkable portion of Internet infrastructure.

The development and use of FOSS is dependent on the licensing practices of the communities. The license of choice is the GNU General Public License (GPL) that in essence states that one is free to use the software and to modify and redistribute it, provided that the modified and redistributed versions are also licensed under the GPL. The GPL is the major legal and social innovation that has made FOSS development possible given the current copyright laws and their interpretation.

² <http://www.opensource.org/>

The open source movement² that relies on the work of the free software community was developed in the late nineties as a business friendly alternative, with a business model and licensing practices of its own. Open source as a movement puts emphasis on the openness of software code as a new method of software development that results in better and more reliable code, possibly with a lower total cost of ownership for the user. Crudely put, the Free Software movement is more a social and political movement, while the Open Source movement is more practically oriented towards the improvement of software, and through that, the empowerment of the users. The Free Software movement is interested in creating a particular kind of community. The Open Source movement is interested in creating software in a particular way.

The two main ideas behind these (mostly overlapping and co-operating) movements are freedom and openness. The first one means the freedom of the user to use, distribute and modify the software without any payment or additional licenses. An example of such modification is the possibility of customising the software for purposes that a commercial software company would not see profitable or otherwise would not implement; a practice that has clear benefits in many contexts where the information society is in the process of development. Second, the openness or transparency of the software means that the user can see how the software works, what it does and whether it does only what it is supposed to do. Or, in case of a problem, what caused the problem and how it could be fixed. Using

proprietary (non-free), closed software is as driving a car that has its hood welded shut. Sure, the car can be used for driving, but if it breaks, the only way to have it fixed is to send it back to the manufacturer for repairs. In the case of free and open source software, any skilled repairperson can investigate and fix the problem.

Free and open source software are clearly a promising strategy for developing information societies because of the benefits they have compared to their closed-source, proprietary counterparts. Because of their licensing and production model, FOSS solutions are seen as more cost-effective, more secure, having higher quality and being open for users' own modifications. The FOSS model has gained a lot of interest in the public sector, especially in developing countries. As a quite comprehensive report *Global Policies on Open Source Software* published by the Center for Strategic and International Studies³ illustrates, a great number of developing countries (in addition to Brazil, Argentina, Chile and Venezuela in Latin America such countries as Thailand, Vietnam, India, Indonesia, Tanzania) are developing or have adopted a FOSS policy or started ICT implementation programs using FOSS solutions.⁴

³ <http://www.csis.org/tech/OpenSource/>

⁴ See also a study prepared by Niranjana Rajani, *Free as in education: Significance of the Free/Libre and Open Source Software for Developing Countries*: <http://www.maailma.kaapeli.fi/FLOSSReport1.0.html>

South American countries like Brazil and Argentina are especially interesting in this regard, because of the large-scale FOSS projects they have started. These countries also seem to have a cultural background that meshes in an interesting way with FOSS practices. For instance, in a special issue analyzing phenomena of current re-mix culture (November 2004), *Wired* magazine claims that the love-affair that Brazil has with free software is not only a technological thing, but relates to other areas of creativity as well: "We pledge allegiance to the penguin, and the intellectual property regime for which he stands. One nation, under Linux, with free music and open source software for all. Welcome to Brazil!"

Given this widespread enthusiasm, it is important to analyse the phenomenon in detail and with a critical eye. The following report, prepared by Master of Public and International Affairs (Virginia Tech) Marko Mannila while working at the Inter-American Development Bank in Washington, D.C., gives an in-depth analysis on the current status of FOSS policies in Argentina and Brazil. The analysis ties questions of policy in an interesting way to wider socio-political issues, including questions of economy, law and public administration.

The Hypermedia Laboratory in the University of Tampere, and the project Global Challenges of e-Development, are glad to be able to publish Mannila's report as a very welcome part of the growing and greatly needed body of research on the use of FOSS in the context of ICT for development.

Tampere, August 1, 2005

Tere Vadén
Niklas Vainio

Hypermedia Laboratory
University of Tampere

Executive summary

In recent years, free and open source software has challenged the dominant position of proprietary software in the international marketplace. Developing countries particularly have paid attention to free and open source software in order to lower software costs, but also as a means to develop their own software industry and reduce piracy. Free and open source software is believed to assist in these issues.

The state has an important role in determining software choice as it has a major impact on the direction of software adaptation in the society as a whole (Schmidt et al. 2002). Free and open source software groups advocate that states should introduce appropriate policies and legislation to promote free and open software, that this will stimulate local software industry and lower entry barriers into the information technology (IT) industry for local firms (FOSSFA 2003). This study will examine the disposition of state institutions, particularly those that address IT policy, in the two Latin American countries that lead free and open source software adaptation on the continent, Brazil and Argentina. Both of these countries are adopting software policies, which could be a model for many developing states.

The Brazilian government has adopted an aggressive policy promoting the use of free and open source software in public administration. Its National Information Technology Institute (ITI) formulates and implements this policy in Brazil. This Institute seeks to diffuse free and open source software in the sectors of civil society, such as the private sector and education. However, it does not support legislation promoting the use of free and open source software, as the institute recognizes that there are technical and political risks in so doing. ITI and the Brazilian government generally seek to lower these risks by cooperating with proprietary software developers.

The biggest risk can probably be found in local software industry and exports. The Brazilian free and open source software companies are too small to compete with multinational companies. Moreover, they are not ready for large-scale exports as they lack some necessary skills such as marketing. Proprietary software developers with advanced business models seem to be better positioned. There is simply not enough experience to estimate the impact on national economy. There are some entry barriers such as language, to which free and open source policy can contribute.

Due to its low cost, free and open source is prominent in education and is increasing access to technology for low-income groups. Therefore, Brazilian institutions promoting free and open source software have better possibilities to be successful in those fields. Experience from the state of Rio Grande Do Sul, where a law promoting free and open source software was passed in 2002, shows that there is no consensus of the benefits of free and open source software. Proprietary software industry is a hard competitor, as it has large resources.

Argentina, which is not as developed in free and open source software policy and adoption as Brazil, has chosen a more careful approach. The government has stated that it will keep policy options open until enough practice of its use has been collected. The principal governmental institution monitoring this question is ASLE (Ambito de Software Libre en el Estado), which has brought civil society actors into the discussion. Initial steps towards a migration from proprietary to free software are cautious.

Two Argentine technology agencies, the National Information Institute (Gestion Informatica) and the Information Technology Office (ONTI), recently announced that they are promoting free and open source software applications in public administration. The reasons they gave for this policy change are cost savings and security. They are also promoting the adoption of free and open source software by local software industry as a means of stimulating national companies to take a larger share of a growing market segment. The results of this software promotion policy are difficult to estimate, as the Argentine software industry is not well developed at this time.

Free and open source software is a promising option in many areas such as increasing access, but the issue is still young. Its economic impact is not well researched due to lack of experience. Potential savings occur only after migration costs are covered, and free and open source software is not necessarily able to increase exports without strong software industry infrastructure. Therefore, there is not enough experience to introduce laws or policies mandating the use of free and open source software.

1. Introduction

Free and open source software means that the user has the right to copy, distribute, examine, change, and improve the software. The most common license is the GNU General Public License (GPL), which is based on the freedom that the originator has the right to make the software available on his own conditions (Stats 2003).

It should be noted that the term “free software” differs from “open source software”. The latter refers to the fact that the source code is available for everybody to investigate and to alter (Linux operating system being the best-known example). Latin American countries widely use the term “free software” (*software libre* or *software livre*), which has more ideological and political meanings, as it is believed that it brings “freedom” from developed countries and from their software industries. The free software movement targets a society that utilizes only freely distributed software. In this study, I will use both of the terms.

There are a wide variety of free and open source software products available. In addition to Linux operating system, applications for databases, for picture editing, for web browsing, and for many other uses can be downloaded from the Internet.

It would be hard to examine the free and open source software issue without a mention of the main challenger, proprietary software (sometimes called commercial software). Proprietary software refers to licenses, which allow only the use of software. The licensee cannot make any changes, examine the code, or distribute it (Stats 2003). The best-known examples are the Microsoft Windows operating system and Office-products.

Another basic difference between these two types of software is the method of development. Proprietary software vendors use paid programmers in developing their products, while free and open source software is usually the product of software communities around the world, which are connected via the Internet. Some proprietary software vendors, such as IBM and Oracle, develop their programs using a free software platform.

The majority of the computers in the world run on Windows proprietary software. However, the use of Linux is increasing and it has a considerable market share in Latin America. Free and open source software is already dominating in some areas, such as web servers.

Free and open source software policies are often evolving in developing nations. One of the main obstacles in developing free and open source software policy is that there is no consensus about most of the issues. Long-term cost savings, security, software industry development, and long-term impact overall are some of the topics that cause disagreements among the supporters of various software types.

2. Enacted technology and software choice

Fountain (2001) developed the term “enacted technology” that consists of perceptions of users, designs, and uses in particular settings. The technology enactment mediates between organizational forms and outcomes, influencing both of them, often leading to changes in the state structure, depending on how information infrastructure modifies communication, coordination, and control.

The technology enactment is visible in the software choice. Migration costs from one type of software to another one vary depending on the perceptions of decision makers. Therefore, these costs are embedded with organizations.

The confrontation between free and proprietary software has a political and ideological tone. The issue is more than a software choice. Free software is believed to be able to change state structures and raise their output: Many free and open source software advocates believe that it creates conditions for freedom and wealth for developing countries (McIver 2003). They want to use free software in building a new, cost-efficient, and democratic state, independent of “the rich developed countries”. (Most major proprietary software developers are in developed countries.)

The software choice is more like an organizational decision than a technical one. This may lead to inefficiencies if chosen software type is technically of lower quality than its competitor. However, an organizational decision can also be beneficial: if interest to migrate is high, implementation and training may be easier.

In the enactment theory, institutional and public management has three critical roles in conceptualizing information technology. First, information technology is a tool, which public managers can use or misuse. It cannot be simply purchased and implemented, but must be integrated in work processes. The second role deals with IT (Information Technology) as a vital infrastructure in governments. When a system is built, it will stay in use for some time, as the costs of construction are usually high. Third, information technology shapes organization structure, as public managers tend to use information technology to produce efficiencies. (Fountain 2001.)

These three roles reveal that changing major technological structures can be a lengthy process. It is likely that a process of changing the type of software takes years. Moreover, creating new organizations or restructuring public administration to examine and implement the software migration will probably be necessary. Public managers may resist changes because they want to maintain their current work processes.

2.1. Role of the state

The role of the state is important in software choices. If the government chooses to promote free and open source software only, it is possible that the free and open source software will eventually take the majority of the market. Furthermore, if the costs to switch to proprietary software are high, free and open source software will continue to have a major market share even if it does not have better quality (Schmidt et al. 2002). Therefore, the state is an influential player in the software issue.

It should be noted that Schmidt assumes that a country, such as Brazil, has introduced a law or a policy mandating the use of free and open source software in public administration. A far more common approach around the world is that distant government bodies can choose their software type freely.

¹ Due to the early development phase of free and open source migration, no corresponding plans exist in Latin America.

The Free and Open Source Software Foundation for Africa¹ (FOSSFA 2003) emphasizes the governments' key role as the largest procurer of information and communication technologies. This is particularly important for developing countries in order to develop state infrastructure and disseminate policies and information effectively. They have normative vision for government's role in IT policy:

- Government should introduce appropriate free and open source software policies and legislation. This will lead to maximizing the return on information and communication technologies through saved license cost and efficiency gain through allowing a wider choice.
- Government should stimulate the local software industry in order to have better export potential and better capacity to satisfy the government's needs. It will also contribute to the development of human resources.
- Government should lower various kinds of entry barriers to new businesses into the IT industry. This refers to issues such as bureaucracy and export regulation.

Given this normative vision, and argument about what government can do, it is worth exploring the actuality of government practice. The research question structuring this work is the following: What is the disposition of state institutions in Brazil and Argentina to free and open source software?

Potential savings occur only after migration costs are covered, and free and open source software is not necessarily able to increase exports without strong software industry infrastructure. Therefore, there is not enough experience to introduce laws or policies mandating the use of free and open source software.

2.2. IT policy making process

Policy formulation refers to the development of policy proposals by interest groups, central government staff, congressional committees, and think tanks. In Latin America, policy legitimating includes the selection and enactment of politics through political actions by congress and the president. The next phase is

implementation: organized bureaucracies, public expenditures, and executive agencies conduct this phase (Dye 2002).

Information technology policy making starts from defining who is responsible for the policy development. That person or group would need to report directly to the president because the strategic importance of the position requires adequate political support. The primary task is to organize actions and to define fundamental issues related to IT development and implementation in every ministry and other entities in state structure. The next step is to elaborate software policy for the state. This includes the diagnostics of the existing infrastructure, formulating a strategic plan, establishing goals and development indicators, and setting a schedule and budget (Hipatia 2003).

A good strategic IT plan consists of several pieces: specific short and long term goals, the assignment of responsibilities for the achievement of those objectives and the determining measures of progress towards those goals, and finally, a discussion about potential obstacles and how they will be dealt with (Barrett & Greene 2001).

2.3. Software choice in Latin America

In relation to free and open source software adaptation, Brazil is the most advanced country in Latin America. As noted above, the central government has introduced a policy promoting free and open source software in all areas of public administration.

Proprietary software users form still the majority, but the number of free and open source software users will catch up soon. Moreover, the country has groups of formal developers and institutional technical norms have already been introduced. Political discussion is widespread (Hipatia 2003). Furthermore, Brazil has the largest economy in the continent.

Argentina is the second most developed country in Latin America in this area. The government has created a forum to examine free and open source software implementation. There are a significant number of software development groups, and they are organized. In addition, Argentina is adopting free and open source software widely in the education field (Hipatia 2003).

In the next two sections, I will investigate the free and open source software policies of Brazil and Argentina through state institutions, particularly those in charge of IT policy.

3. Brazil

The Brazilian legislative assembly has not passed laws promoting free and open source software, but the current government adopted a policy in 2003 promoting free and open source software.

3.1. Policy making process and IT

The state-funded National Institute of Information Technology (ITI) coordinates the national information technology policy in Brazil. The ITI is administratively directly under the presidency and therefore has a strong political support. However, the ITI has no mandate for the task. The Ministry of Planning, Budget, and Management is formally in charge of standards and use of software. The Ministry has followed the ITI policy (CB 2003). Within the Ministry, the National Scientific and Technological Development Council is in charge of software policy. In November 2003, no budget was proposed for the migration to free and open source software and it was unclear which Ministry would allocate the funds needed (CB 2003).

3.1.1. Formulation

The main justification driving this policy adoption is cost savings: the government spends \$34 million yearly on proprietary software licenses. Moreover, the government wants to boost the country's software export. A third purpose is to extend computer access to low and middle-income families (Alerigi 2003).

The central government argues that it will save the funds spent on license fees by using free and open source software; the general idea is that savings will increase in coming years when license fees will disappear².

² The cost factor is common in Latin America: Peru, Costa Rica, and Colombia, among other countries, emphasize savings in proposals for bills of free software. See: <http://www.softwarelibre.cl/>

3.1.2. Policy legitimating

Various legislative proposals mandating the use of free and open source software have been introduced: one every year between 1999 and 2003 by left-wing representatives. These proposals would give preference to free and open source software solutions in public administration and in publicly owned companies. None of these have been approved (see Pinheiro 1999; Miranda 2002; Alves 2003).

The congress announced in August 2003 that certain proprietary software licenses will not be renewed but will be replaced with free and open source software (SLC 2003). One hundred and thirty-five congressmen (of total of 513) and senators have formed a group, called "Frente Parlamentarista Pelo Software Livre e Inclusão Digital", which has created a platform to discuss the use of free and open source software in government (CB 2003).

3.1.3. Implementing

The ITI issued guidelines to migrate to free software in October 2003. The main objectives of these guidelines are to increase

training of personnel, to define and implant interoperable standards, to bring free and open source software to schools and universities, to promote migration and adaptation of applications for open platforms, to promote the adaptation of free and open source software in Brazilian industry, and to extend the provision of services to the citizens in open platforms (CT 2003).

The ITI argues that the migration should not be made compulsory because gradual migration would give better results. Part of the ITI policy is that agencies can freely decide the type of software they will use (SA 2003; Alerigi 2003); this option requires interoperability between platforms. The National Scientific and Technological Development Council does not recommend compulsory migration to free and open source software either, noting that migration should not be made compulsory in public administration, as it takes time, and no cost evaluations or training programs have been completed (NP 2003).

3.1.4. Finding the best alternative

Although there is evidence of potential savings by using free and open source software, Brazilian officials have not estimated what those might be. Therefore, the government is not sure how long it would take to cover the costs of migration. Moreover, proprietary software will be in use at least for several years, so technical issues, such as interoperability, might hinder the migration. Proprietary software has already proven its capability in software exports, but free and open source software has to start from almost zero-level. However, free and open source software is probably beneficial for other uses, such as increasing access to knowledge, due to its lower costs.

3.2. Legislative activity and IT

There are two issues, which might add pressure on policy-makers. First, free and open source software legislative proposals have considerable support (135 congressmen of total of 513) in the federal congress. Although a minority, the opinion of 25 percent of congressmen is important, especially if they are able to gather additional support.

Second, the congress' announcement of not renewing proprietary software licenses is against the ITI position and sets time limits, since plenty of software is old and must be updated in the near future. For example, the Ministry of Foreign Affairs of Brazil still uses the Windows 95 operating system and plans to migrate directly to Linux without considering Windows upgrades initially (CB 2003). The Windows 95 operating system is old and Microsoft does not support it anymore, so if the ministry sticks with Windows 95 for too long, it might lose compatibility with newer applications, which would hinder the flow of information.

3.3. Terms of public debate

3.3.1. Costs

International experience indicates that free and open source software brings considerable savings (Teknologirådet 2002). It is clear that these savings vary by country, mainly depending on the average salary, the average computer skills of users, the number of users, the cost of software licenses, the number of computers and servers, and other issues (see Teknologirådet 2002). These calculations can be done, as an inventory of government infrastructure exists (see migration plan) and other appropriate statistics are available³. Brazilian authorities had not made these calculations in November 2003. Besides that, no long-term experience of savings exists in Brazil (nor anywhere else), which increases uncertainty. These calculations would make the decision-making easier.

³ SOFTEX (Organization of Brazilian Software Exporters) provides statistics about software industry.

3.3.2. Exports

The software imports of Brazil outnumber exports. The country exported software worth \$100 million in 2001, but the imports were ten times larger (Alerigi 2003). There are a couple of obstacles to export; language is one of them, as end users prefer that software developers are proficient in English (Info Americas 2003). Moreover, Latin American countries such as Brazil are not known for their software industries, which can be a problem, as customers do not necessarily trust on Brazilian IT products (Info Americas 2003; Behrens 2003). However, Brazil has some advantages, including plenty of skilled programmers combined with the low cost of labor.

As noted earlier, the proprietary software industry is powerful in Brazil. It provides a major share of the country's software exports (LS 2003). Therefore, increasing software exports by promoting free and open source software is risky. Brazil might lose the amount of exports that proprietary software generates, and it is unclear whether free and open source software companies could replace the loss.

3.3.3. Increasing access

The Brazilian government's policy states that increasing access to knowledge among Brazilian families is essential. Accessibility to new technologies would increase the number of computer savvy people and bring competitiveness to Brazilian industry. The ITI supports this policy by increasing the provision of services, which would lure more users. Free and open source software provides a readily available, low cost solution. An interesting issue is to compare gross domestic product and the cost of proprietary software license. An average Brazilian (GDP \$2915 annually) would have to work 2.31 months to purchase the Windows operating system, whereas an average Latin American need only 1.55 months (GDP in Latin America \$4335) (Ghosh 2003). Proprietary licenses are usually renewed every 2–3 years, which increases the economic burden.

On the other hand, software forms only 3–7 percent of the total cost of ownership for computer systems. Hardware and

maintenance costs are much higher (LS 2003). However, this calculation is probably made for big companies, which need to pay for networking, help desks, etc. Therefore, maintenance costs may be lower in private use. Although software is not the principal investment, free and open source software can help bring costs down a bit, but it is not a crucial factor in expanding access among low-income people. Lower hardware prices would contribute more to expanding access to new technologies, which is at a lower level than in some other countries in the region: in 2002, Brazil had 7.5 computers per 1000 inhabitants, Argentina 8.2 and Chile 11.9.⁴

⁴ See International Telecommunication Union: <http://www.itu.org/>

However, this part of the policy seems to be the most likely to have success: even a small decline in the acquisition costs of computer hardware and software would increase the number of people who can afford a computer, resulting in economic benefits.

3.3.4. Migration plan

The ITI migration guidelines include many characteristics of the good IT strategic plan described earlier. Missing is any discussion about potential obstacles and how they are to be dealt with.

The migration project is big, as the government has 400,000 users, 300,000 desktops, and thousands of servers (SA 2003). The target is that 80 percent of all computers in state institutions and state-owned companies would use an operating system based on free and open source software in 2006.

Two years seems to be a short time for the migration. It would require that 15,000–20,000 users are trained every month. In addition, this program would need hundreds of trainers with previous knowledge of free software. The migration process could be completed faster in regions that already have experience with free and open source software and where there is a developed software industry such as São Paulo, Campinas, and Rio de Janeiro (Behrens 2003), but it is still questionable whether the goals could be reached by 2006. Furthermore, no funds for migration were allocated. These uncertain issues can hinder the implementation of the law of free and open source software.

3.4. Key challenges

3.4.1. Local development

The Brazilian software industry is ready to expand, as it has enough skilled programmers (Behrens 2003). Brazilian business is moving forward by adopting free and open source software. The Chambers of Commerce promoting free and open source software have already been formed, and computer providers offer services based on free software platforms. Electronic commerce is also being developed (Hipatia 2003).

It is crucial for the further adaptation of free and open source software in the Brazilian private sector how domestic businesses can derive benefits. Brod (2003) notes that small and medium size enterprises in Latin America cannot afford proprietary software, so they would benefit from free and open source software

by hiring more people to reach a higher competition level. Local software companies would need to develop appropriate applications and provide support for local industry. The international free and open source software community will provide support for this task, and the quality of the support has already proved to be high (Dravis 2003).

However, the majority of Brazilian free and open source software companies are small and not able to provide nationwide services (MW 2003). Moreover, they would need the marketing skills of multinational companies. Experience shows that lack of international experience hindered development in the 1980s, when Brazil tried to develop its computer hardware industry (Behrens 2003).

In addition, proprietary software industry is still very influential in Brazil. It has a clear business model and value chains, which create long-term benefits and employment (LS 2003). Business models of free software are still in a developing phase. Free and open source licenses allow free copying and distribution, which means that companies have to find another ways to generate revenue, such as training and services. The commercial i.e., proprietary software business model has brought economic and socio-economic gains, but free and open source software has not done that yet (Smith 2002).

As the impact of public administration on software choices is big, a law promoting free and open source software might change the course of development in the Brazilian software industry. However, there is no evidence of that free and open source software can replace proprietary software in this area.

3.4.2. Technical development

Interoperability will be a very important issue at least for the next couple of years. In the U.S., it is more likely that a combination of the two systems will be used rather than a single one (Seifert 2002). Proprietary software will stay in use for at least a couple of years. Regarding the applications of free and open source software, the basic programs, such as those for office and for database, already exist, but many sophisticated applications are still under development.

Technical flaws can bring political problems. The Venezuelan secretary of information Felipe Marti resigned in 2003 after his free and open source software policy failed. Technical reasons contributed to the failure (Lared 2003). The ITI pays attention to technical risks by not promoting the free and open source software law, and leaves software choices open. Political risks are lower than in Venezuela, as there is a quite high level of knowledge of free software among citizens in Brazil (Hipatia 2003).

3.5. Local experience

Rio Grande do Sul was the first state in Brazil that approved a Bill of Free Software in December 2002. The law gives preference to free and open source applications in public administration (Bohn Gass 2002). Rio Grande do Sul is situated in the

southeastern region of Brazil, where 55 percent of the IT employment is located; therefore the labor supply is not a problem.

A state owned company, Procergs, is in charge of implementing the law. Procergs maintains the state network and handles all IT services in Rio Grande do Sul, such as finance, security, schools, and taxation. It does not believe in free and open source software. According to the company, it is difficult to turn the law promoting free and open source software into practice (PC & F 2003). The company admits that the cost savings are significant, but emphasizes obstacles: the definition of free and open source software is unclear, and there is no advantage using free and open source software in many applications. Another problem with developing open source software is that the open source companies cannot hire the best programmers, as proprietary software developers pay higher salaries (PC & F 2003).

The first issue of translating laws into practice can be seen as political and ideological, as there are many definitions of free and open source software in relation to proprietary software. In addition, free software licenses are clearly defined (GNU, n.d.). Moreover, many local experts disagree about the advantage of using free and open source solutions (JDSR 2003). This opinion may reflect the resistance to change and the organization's desire to maintain its current work processes.

The other issue of costs is a strong one. If proprietary software developers can pay high salaries and hire the best programmers, this could hinder the development of free and open source software solutions and affect public administration. It would be more difficult for the state to hire experienced people for their own IT departments.

There are two factors contributing to this issue, the geographical location and the IT labor supply. As stated above, the labor supply is adequate in the southeastern region. In regard to the labor market overall, Brazilian IT labor markets have reached the saturation point, which means that there are a substantial number of IT professionals available in the country (Behrens 2003). As a result, there should be enough skilled programmers in the region.

However, it is difficult to say how many of those programmers are oriented to open source software. If the majority of the programmers want to work with proprietary software, this could be a problem for the development of free and open source software. This might be an obstacle in other regions of Brazil as well and hinder the implementation of a law mandating the use of free and open source software.

3.6. Specific issues in Brazil

3.6.1. Competition

Still, Brazil might keep its software options open. Microsoft has invited the government to participate in the Microsoft Government Security Program (GSP), which allows governments to examine the source code of Microsoft programs but not to modify or to deliver it. This program is seen as a countermeasure to

the expansion of free and open source software (AT 2003) and indicates that Microsoft wants to compete with free and open source software, for which source code is available for everybody. The participation in the GSP program does not require limiting the use of free and open source solutions. This policy can be seen to have two purposes: either the government wants to maintain relationships with the leading software maker or it wants to examine the source code to ensure interoperability between free and open source software and proprietary software solutions, or both. Moreover, this means that the government of Brazil acknowledges that free and open source software might not be the best solution.

3.6.2. Language

The language problem can hinder software development. Because of the small market size, many proprietary software solutions as well as free and open source software applications lack Portuguese versions. The Ministry of Education has purchased 12,000 computers for schools, using Linux and OpenOffice, but the project has been delayed because of lack of help in the Portuguese language (CB 2003).

Language issues may be partially resolved, as IBM has agreed to finance the translation of OpenOffice programs to Portuguese (CB 2003). Still, some internationally developed programs do not have Portuguese versions, and in many minority languages there often are no programs at all available. The language issue is a clear asset for free and open source software, since volunteer user groups can translate applications without charging fees. Increased access to computers would increase the amount of clients and create new business opportunities.

3.6.3. Excessive bureaucracy

Two important issues in creating business models for information technology in developing countries are how to transfer business knowledge in an information society and how to identify new opportunities. Government agencies must supply information, and they should interact with software industry in constructing business models⁵ on issues such as taxation, trade regulations, and legal frameworks (Dong et al. 2002).

There are a few of bureaucratic obstacles, particularly those of export companies (CB 2003). Policy makers may want to pay attention to these. Requiring excessive amounts of paperwork, which delay business contracts, is one example. Another one could be language problems. Brazilian officials seldom speak English, which raises expenses because of translation costs.

⁵ The business model is crucial in the development of free and open source software, which does not have a clear business model, as the software is distributed at no cost. Its competitor, proprietary software, has a developed business model: it sells licenses.

4. Argentina

4.1. IT policy making

4.1.1. Formulation

In Argentina, the central government enforces a policy that does not give preference to either type of software. The goal is not to go from one extreme to another, but to use both types of software. Proprietary software will be used until the contracts end, and after that, new contracts will be negotiated on the value-for-money basis, considering both alternatives (Irigoyen 2003). The idea behind this approach is that proprietary software developers tend to offer competitive pricing when other options are available.

The National Information Technology Office (ONTI), part of the Undersecretary of Public Management, coordinates information technology policy and implementation in Argentina. The National Information Office (Gestión Informática), which is administratively under the Ministry of Domestic Affairs, is in charge of extending access to information in the country.

The two institutions, the ONTI and the National Information Office, announced in March 2004 that they promote Linux in all applications in public administration. The rationale for this decision is lower costs, the creation of local employment, and security (SLC 2004). Moreover, the two organizations are planning to create one government portal, through which all public purchases would be channeled. This is intended to reduce corruption by publishing all public purchases (DIR 2004b). The ONTI also recognizes the importance of migration cost calculations (Noticias 2004).

4.1.2. Legitimizing

The first proposal for the bill of free and open source software was introduced in April 2001. After a series of committee meetings and consultancy meetings, the bill expired in March 2002. Shortly after, a new proposal was made. It states that free and open source software will be mandatory for government agencies and some other organizations, such as state-owned companies. The Committee of Communications and IT evaluated the proposal and decided in July 2003 to study the issue further before making any choices (Dragan et al. 2002).

4.1.3. Implementation

The ONTI and the National Information Office are the main organizers in the ASLE (Ámbito de Software Libre en el Estado) institution, which collects the information related to experiences of free and open source software in public administration. The institution has the support of the central government. The ASLE arranged a series of conferences in collaboration with different officials of Argentine government during the year 2003. The ASLE has approached the issue by gradually expanding the amount of the parties involved. In the first conference, mainly government IT officials attended. After that, the discus-

⁶ See ASLE:
<http://www.softwarelibre.gov.ar/>

sion was expanded to the academic field and further to software industry and non-government organizations.

The main arguments⁶ of these conferences were as follows:

- 1) Free and open source software would reduce government IT costs.
- 2) Workshops concerning information security should be arranged.
- 3) It is necessary to create mechanisms to increase personal capacity in public administration.
- 4) Support of the private sector is essential to the development of free software.

The central government policy will have a large-scale implementation in the near future: over the next three years, the Argentine central government plans to purchase 50,000 computers for schools. Under this plan, schools are free to choose their software (DIR 2004).

Argentine IT policymakers have a less aggressive approach than those of Brazil. They do not aim at expanding the use of free and open source software in every field of society like their Brazilian counterparts, nor do they have visions of increasing software exports. Moreover, they want to have proprietary software developers involved in the process. These factors reduce the risks of policy failure.

4.2. Legislative activity

⁷ <http://proposicion.org.ar/proyecto/leyes/904-D-02/>

The proposed law has not advanced since the Committee of Communications and IT decided to study the issue further before making any choices. The committee may discuss the issue with representatives of proprietary software industry.⁷ Like the ASLE, the committee members emphasize the importance of the proprietary software industry involvement in software policy development. This approach may help in reaching consensus about software laws.

The first proposal for the bill was signed by three congressmen, two of them members of the science and technology committee of the congress. The last version was signed by only one of them, Marcelo Dragan. He seems to be the main promoter of the law, but he has failed to raise enough political support to pass the law.

4.3. Terms of public debate

4.3.1. Savings

Calculations of the migration costs have not been made. Savings will not be as high as in Brazil, as Microsoft sold software worth \$4 million to the government in 2002 (Irigoyen 2003). As mentioned earlier, international experience holds that free software is cost effective.

One possible reason for the Argentine government to keep software options open is maintaining competition, which would keep prices low. There is already some international experience that dominating proprietary software vendors have considerably reduced license fees, when a competing open source solution is

available (ITViikko 2003). As the largest software vendors operate around the world, this might happen in any part of the world as well.

4.3.2. Software market

The Argentine software market has seen a solid growth. Between 1996 and 2001, the annual increase of the amount of enterprises was 5.6 percent and employment grew 9 percent. For the period 2001–2006, estimates forecast that enterprises will grow 5.6 percent annually and employment will raise more than 7 percent. In 2003, about 4000 new jobs were created in the software industry, mainly because of exports. (Sallstrom & Damuth 2003.) The value of exports is still low, \$13 million in 2001.⁸

⁸ See CICOMRA:
<http://www.cicomra.org.ar/>

The two technical institutions, National Information Institute and ONTI, have noted the growth in the IT sector, and they would like to take a larger share for domestic software developers by promoting free and open source software in public administration. It is a somewhat risky policy, as proprietary industry production can decrease significantly (The foregoing figures by Sallstrom et al. rely mainly on the output of proprietary software industry). However, the institutions' plans are not too ambitious, particularly as they do not promote software exports. The Argentine software industry is still small and it would need to develop more before starting to export in the large scale. There may not yet be a broad enough base for free and open source to grow, even though public administration would accelerate the development.

4.3.3. Security

Sallstrom & Damuth (2003), based on the data of secure servers, concluded that Argentina is regionally advanced in data security means, but worldwide, it is below average. Free and open source software is believed to be more secure than proprietary software: when the source code is available to everybody, it is more difficult to implant malicious code there.

⁹ The FBI had "The Magic Lantern Plan" (Sullivan 2001), which included eavesdropping by secretly installing keylogging software on suspects' computers.

The security of free and open source software is quite a strong argument, as even suspicions of compromising national security or personal data can lead to the rejection of one of the options.⁹ Some proprietary software vendors, such as Microsoft, have accessed this problem by "opening" their code to some states and software developers (see 3.6.1).

Free and open source software is superior to proprietary software in this feature. However, users have not paid much attention to this fact. Although this point may be recognized in the future, currently its importance is not considered high enough to speed up free and open source software policy making.

4.3.4. Fighting corruption

The argument of fighting corruption by listing public purchases on the Internet is not new. The former Venezuelan secretary of information used this argument to support his free and open source software policy. The secretary estimated that government officials require around a ten percent bribe with every transaction (Hung 2002). So, if the corruption figures were simi-

lar in Argentina, free and open source software would be a real economic and social advantage. However, this system could be established using proprietary software as well, so it is not a strong reason for supporting the use of free and open source software.

4.3.5. Migration costs

The issues presented by ASLE are a way to develop migration guidelines. However, they are not very specified, and therefore cannot be considered as a good IT strategic plan (Barrett & Greene 2003). The arguments follow the careful approach of ONTI and the National Information Office. ASLE sticks to arguments that are supported by international experience. Moreover, the arguments do not aim at expanding free and open source software to civil society actors, but rather to develop it in public administration. This approach of collecting experience first does not raise expectations very high and therefore it is less risky.

The ASLE emphasizes creating mechanisms to increase personal capacity in public administration. Training centers for teachers are required. Brazil has experience in this matter: the São Paulo telecenter project has noticed that learning to use free and open source software applications is easier than anticipated. Even people with a minimal level of education have learned to use the systems (Dravis 2003). Thus, perhaps a public servant will learn to use free and open source software applications quite easily. The challenge lies, therefore, merely in organizing this task and finding funds for the training centers. If these costs are high, the migration might be delayed.

4.4. Key challenges

4.4.1. Access to information

As mentioned, the applications of free and open source software are quite easy to learn. More likely the problem is that people resist learning new procedures if they are not required to do so. Increasing knowledge of technology by increasing Internet access and providing basic computer skills training could resolve this problem. The Latin American states have good capabilities to enlarge access, particularly among low-income groups (Corrales 2002). However, Argentina is not behind its neighbors: 11 percent of the Argentine population had access to Internet in 2002, better than the average for Latin America.¹⁰

Another interesting calculation would be comparing GDP and the cost of the proprietary software license (the Windows operating system). An average Argentine (GDP \$7166) would have to work only 0.94 months to purchase the mentioned operating system, whereas an average Latin American would need 1.55 months (GDP in Latin America \$4335) (Ghosh 2003). These figures show that the digital divide is less of a problem in Argentina than in Latin America overall. Free and open source software is promising in this field.

¹⁰ The International Telecommunication Union: <http://www.itu.org/>

4.4.2. Piracy

Software piracy in Argentina has stayed seven points above the average Latin American level of 55 percent in 2001 and 2002 (BSA 2003). International Intellectual Property Alliance (IIPA), who monitors copyright violations and piracy, has placed Argentina on its Priority Watch List (IIPA 2003). Sallstrom et al. (2003) notes that Argentina does not comply with TRIPS (International Intellectual Property Protection Agreement). They recommend that the country should strengthen the copyright protection.¹¹

¹¹ What is ironic is that the government is accused to be one of the worst copyright violators (Scheeres 2001).

It is essential for Argentina to reduce the piracy rate, particularly if the country wants to be eligible for international trade agreements. Free and open source software are being seen as a solution to this problem,¹² as users do not have to pay for the licenses.

¹² Some developing countries, such as Vietnam, have launched an open source initiative in order to lower very high piracy rate, which even threatens the country's economy (Stocking 2003).

It is clear that the availability of software free of license fees would drop piracy rates dramatically. On the other hand, proprietary software developers argue that if Argentina's piracy rate dropped by ten percent, IT revenue would grow by 300 percent in five years (BSA, n.d.). This calculation naturally refers to the use of proprietary software. Overall, this issue needs to be well examined, as the potential gain is great, but there is not enough experience to estimate what the result would be.

4.5. Local experience

Despite the many legal initiatives introduced in Argentine's states, the only state that has taken action is the province of Buenos Aires. The state passed a declaration promoting free and open source software in June 2002. The corresponding law was approved by the Senate and sent to the House in November 2003.

Debate over the law reveals the breadth of disagreement between the free and open source software advocates and the proprietary software industry. The proprietary software developers argue that their products are cost-efficient in terms of the total cost of ownership. The proprietary software developers also argue that a law promoting the use of free and open source software in public administration would hinder the development of proprietary industry. Furthermore, the software industry overall would suffer, as proprietary software industry forms the major part of it (Cessi 2002).

Free and open source software advocates respond that computer security and transparency in public decision-making are the most important issues when making software choices.

All these arguments are very general and already discussed. They reveal that the province of Buenos Aires has not benefited from the local experience, which it has gained since the province started to use free and open source software in 1994. It could better utilize the experience in planning its software policy. Moreover, the IT budget is tight in the province (FAD 2003), so, a better general accounting of experience would help to concentrate the resources in the right places.

4.6. Specific issues in Argentina

4.6.1. Privacy law

Argentina adopted a new, strict privacy law in December 2001. The downside of the law is that it can restrict the free flow of information (Sallstrom & Damuth 2003). This law adds new requirements to data processing, and further, to software development. However, it might offer an opportunity for free and open source developers: free and open source software can contribute in this manner by letting anyone examine the source code to increase security. Furthermore, free and open source software has experienced considerably fewer virus attacks. In addition, free and open source software lets individual users add their own security features (Kenwood 2001). The facts support the case for using free and open source software; however, privacy is only a minor issue in software policy making.

5. Conclusions

5.1. Brazil

The agency executing Brazilian government's IT policy, the ITI, strongly promotes a wide adaptation of free and open source software. The government policy contains many issues whose impacts are unknown. The costs of migration have not been calculated, and promoting free and open source software can bring losses to the national economy. The migration plan also includes some risks: the ITI wants to extend free and open source software to the private sector. The impact of this is unknown, as there is not enough experience. The National Science and Technology Council acknowledge these risks as well.

The ITI tries to control these risks by allowing government agencies to choose their software freely and by not promoting laws mandating the use of free software. In addition, the central government keeps the software options slightly open by negotiating with proprietary software developers. Brazil cannot phase out proprietary software completely in the next couple of years, as proprietary software developers still hold a dominating position in many markets. Therefore, it would be beneficial for Brazilian government agencies not to underestimate proprietary software developers, but rather to try to include them in their software policy.

The risks of this policy are significant for the national economy, as proprietary software developers are influential in local software development and the industry has clear business models and marketing strategies. Free and open source software industry has not developed these models enough. Moreover, the export rates can decrease significantly if free and open source software developers cannot make up losses from rejecting proprietary software.

The government's policy to increase access to low-income groups and promote free and open source software is less risky. Lower costs of free and open source software would contribute by spreading access to those groups that proprietary software has not reached. In the long term, this will contribute to the economy by bringing forth customers and skilled workers.

There are some entry barriers to local companies in the software market. Language is sometimes a problem, as applications have not been translated into Portuguese, but the free and open source community can alleviate this barrier. Moreover, Brazilian policymakers should focus more on removing bureaucratic obstacles hindering software companies.

Experience from Rio Grande do Sul shows that there is no consensus on the benefits of free and open source software. Short-term benefits, such as cost savings, seem to be clear, but long-term benefits still haven't been proven. The impact on the state's economy, employment, and competitiveness should be examined. This experience would help in policy-making and law implementation.

5.2. Argentina

The Argentine central government is keeping its software policy options open until enough free software experience has been collected. It collects data through the ASLE institution, which is taking steps towards a migration plan. These steps are careful, as they do not include free software adoption in sectors other than public administration. Moreover, arguments about the benefits of free and open source software are mainly based on experience collected around the world.

Recently, two technical institutions, the National Information Institute and the National Information Technology Office, have started promoting the development of free and open source software in public administration and the private sector. The growth of a national software industry will be significant in the next couple of years and the aim is for the local free software industry to gain market share. As in Brazil, this increases the risk of policy failure, but as the Argentine software industry is not very developed, potential losses would not be very large. Overall, Argentina is regionally quite advanced in terms of data security and computer penetration.

To study the free and open source software issue further, Argentina would need to develop a better general accounting process. To support government policy choices, this institution should collect experiences in issues such as potential savings, training, and the software industry. The government would also need to integrate other factors, such as privacy laws, into free and open source software adoption policies.

The political issue of fighting corruption has emerged, and the Internet may offer a way to reduce corruption by making public government purchases transparent. However, free and open source software does not bring any advantages in this issue.

State officials' experience from the province of Buenos Aires follows the foundations of the declaration. They acknowledge the high piracy rate and need for education. Lowering the piracy rate may be possible by conducting public awareness campaigns although the positive impact of this approach has not been proven. Since this is a nationwide problem, the province of Buenos Aires would be an appropriate place to study this issue, and if successful, the results could be utilized in other parts of Argentina as well.

Increasing computer skills among the general public is also a priority not only in the province of Buenos Aires, but for the whole Argentina as well. As mentioned earlier, free and open source software has increased computer skills. Therefore, the province could also execute training programs and share the results for the good of the entire nation.

5.3. Governments and the enactment theory

In relation to the technology enactment theory, Argentine and Brazilian governments recognize the risk that they can misuse the technology by supporting free and open source software.

Both of the governments keep the proprietary software option open in case that free and open source software cannot be adapted in work processes. They have invested in free and open source software infrastructure and training, but at the same time, they still benefit from earlier investments in proprietary software. As a result, both of these software options will exist for many years to go, as the costs of migration are high. The software issue slowly but surely shapes organizational structures in government agencies: both of the countries establish new agencies or reorganize existing ones depending on software needs.

References

Interviews

- AT (2003): Arja Terho, IT specialist, Ministry of Finance of Finland. November 14, 2003 by e-mail.
- CB (2003): Claudio Brito, Consultant, Ministry for Foreign Affairs of Brazil. November 17, 2003 Brasília, Brazil.
- JDSR (2003): Joel Dos Santos Raymundo, Director, Procempa. November 21, 2003, Porto Alegre, Brazil.
- LS (2003): Luiz Sette, IT Expert, Microsoft Informatica. November 20, 2003, São Paulo, Brazil.
- MW (2003): Marcos Waromby, Executive Director, Seprorgs. November 25, 2003, Porto Alegre, Brazil.
- NP (2003): Nelson Prugner, Consejo Nacional Desenvolvimento Científico e Tecnológico. November 17, 2003, Brasília, Brazil.
- PC & F (2003): Carlos Alberto Pacheco de Campos, director-president, & Ronei Martins Ferrigolo, director of development, Procergs, Estado do Rio Grande do Sul. November 21, 2003, Porto Alegre, Brazil.
- SA (2003): Sergio Amadeu, Director-president, Instituto Nacional de Tecnologia da Informação. November 18, 2003 Brasília, Brazil.

Literature

- ALERIGI Alberto (2003), Brazil Government Snuggles up to Linux. — *Reuters News Service*, November 23, 2003.
- ALVES Coronel (2003), *Projeto de Lei*. — URL (retrieved December 12, 2003):
<http://200.219.132.4/sileg/integras/168592.htm>
- BARRETT Katherine & GREENE Richard (2001), *Powering Up: How Public Managers Can Take Control of Information Technology*. Washington, D.C: CQ Press.
- BEHRENS Alfredo (2003), *Brazilian Software: The Quest for an Export-Oriented Business Strategy*. London Business School, Centre for New and Emerging Markets. 2003.
- BOHN GASS Elvino (2002), *Projeto de Lei n.º 006/2002*. — URL (retrieved January 5, 2004):
<http://www.al.rs.gov.br/proposicoes/2002/pl/PL006-02.html>
- BROD Cesar (2003), Free software in Latin America. — Niranjana Rajani, Juha Rekola & Timo Mielonen, *Free as in Education: Significance of the Free/Libre and Open Source Software for Developing Countries*. Helsinki: Ministry for Foreign Affairs of Finland.
- BSA (2003), *Eight Annual BSA Global Software Piracy Study: Trends in Software Piracy 1994–2002*. Washington, D.C: Business Software Alliance.
- BSA (n.d.), *Latin America's IT Sector Could Grow To Employ 750,000 People*. — URL (retrieved December 11, 2003):
http://global.bsa.org/idcstudy/pdfs/Latin_America.pdf
- Cessi (2002), Letter to Congressman Alfredo Conde on October 4, 2002. Chamber of Software and Information Technology Services of Argentina.

- CORRALES Javier (2002), *Lessons from Latin America*. — Leslie Simon, David Corrales & Donald Wolfensberger, *Democracy and the Internet*. Washington, D.C: Woodrow Wilson Center.
- CT (2003), *Câmara Técnica de Implementação do Software Livre: Planejamento Estratégico 2003–2004: Diretrizes, Objetivos e Ações Prioritárias*. Brasília: National Institute of Information Technology of Brazil. 2003.
- DIR (2004), *El Ministerio de Educación comprará 50.000 Computadoras*. — Directorio del Estado. URL (retrieved April 16, 2004): <http://www.directoriodelestado.com.ar/contenido.php?pais=Argentina¬a=271>
- DIR (2004b), *La Argentina también opta por el software libre*. — Directorio del Estado. URL (retrieved April 2, 2004): <http://www.directoriodelestado.com.ar/contenido.php?pais=Argentina¬a=223>
- DONG Minyue, OSTERWALDER Alexander & ROSSI Mathias (2002), *The Business Model Handbook for Developing Countries*. Lausanne: University of Lausanne.
- DRAGAN Marcelo, BECERRA Omar Enrique & BERTONE Rosana Andrea (2002), *Proyecto de Ley 904-D-02: Política de utilización de software libre por el Estado Nacional*. — URL (retrieved December 12, 2003): <http://proposicion.org.ar/proyecto/leyes/904-D-02/>
- DRAVIS Paul (2003), *Open Source Software: Perspectives for Development*. InfoDev, World Bank.
- DYE Thomas (2002), *Understanding Public Policy*. New Jersey: Prentice Hall.
- FAD (2003), *Primer Encuentro Patagonico de Software Libre en los Estados Provinciales*. Ushuaia: Fundacion Apertura Digital. 2003.
- FOSSFA (2003), *The Free Software and Open Source Foundation for Africa: Action Plan 2003–2005*. 2003. — URL (retrieved December 12, 2003): <http://www.fossfa.org/>
- FOUNTAIN Jane (2001), *Building the Virtual State: Information Technology and Institutional Change*. Washington, D.C: Brookings
- GHOSH Rishad Aiyer (2003), License fees and GDP per capita: the case for open source in developing countries. — *First Monday*, volume 8, number 12 (December 2003). — URL (retrieved January 12, 2004): http://firstmonday.org/issues/issue8_12/ghosh/
- GNU (n.d.), *The Free Software Definition*. Gnu.org. — URL (retrieved December 12, 2003): <http://www.gnu.org/philosophy/free-sw.html>
- HIPATIA (2003), *Fases en la Adopción del Software Libre: Fortalezas y Barreras*. October 2003. — URL (retrieved March 12, 2004): <http://www.hipatia.info/>
- HUNG Veronica (2002), *E-Gov in Tiempos Dificiles*. Lared.com. September 2002. — URL (retrieved December 12, 2003): <http://www.lared.com.ve/>
- IIPA (2003), *Special 301 report on global copyright protection and enforcement*. International Intellectual Property Alliance.
- Info Americas (2003), Can Mexico develop a software maquiladora industry? — *Info Americas Tendencias*, Issue 38, March 6, 2003.
- IRIGOYEN Pedro (2003), *El gobierno argentino le abre la puerta al software libre*. Clarin.com. — URL (retrieved December 12, 2003): <http://www.clarin.com/diario/2003/09/01/t-614846.htm>

- ITViikko (2003), Turku luopui open source -hankkeesta [Turku gave up the open source project]. – *ITViikko* [IT Weekly]. December 2003.
- KENWOOD Carolyn (2001), *A business case study of open source software*. Mitre Corporation.
- LARED (2003), *Software Libre Sale de Cadivi*. Lared.com. April 25, 2003. – URL (retrieved December 12, 2003):
<http://www.lared.com.ve/archivo/esoft74-3.html>
- MCLVER William (2003), *Peru trip report*. Computer Professionals for Social Responsibility. – URL (retrieved March 12, 2004):
<http://www.cpsr.org/conferences/peru/MclverPeru200308.pdf>
- MIRANDA Sergio (2002), *Projeto de Lei*. – URL (retrieved December 12, 2003):
<http://200.219.132.4/sileg/integras/77476.htm>
- Noticias (2004), *Argentina abre sus puertas a Linux*. Noticiasdotcom. – URL (retrieved March 19, 2004):
<http://www.noticiasdot.com/publicaciones/2004/0304/1703/noticias170304/noticias170304-14.htm>
- PINHEIRO Walter (1999), *Projeto de Lei n.º 2.269/99*. CIPSGA. – URL (retrieved December 12, 2003):
<http://www.cipsga.org.br/sections.php?op=viewarticle&artid=85>
- SALLSTROM Laura & DAMUTH Robert (2003), *El Papel Fundamental de la Industria del Software en el Crecimiento Económico*. Foco: Argentina. CompTIA, La Asociación de la Industria de la Informática y la Tecnología.
- SCHEERES Julia (2001), Argentina mulls open-source move. – *Wired News*, May 4, 2001.
- SCHMIDT Klaus & SCHNITZER Monika (2002), *Public subsidies for open source? Some economic policy issues of the software market*. University of Munich.
- SEIFERT Jeffrey (2002), *Computer software and open source issues: a primer*. Congressional Research Service.
- SLC (2004), *Software libre avanza en Argentina y Brasil*. Software Libre Chile. – URL (retrieved April 1, 2004):
<http://www.softwarelibre.cl/modules.php?op=modload&name=News&file=article&sid=311&mode>
- SLC (2003), *Gobierno federal brasileño da un paso más rumbo al software libre*. Software Libre Chile. – URL (retrieved November 29, 2003):
<http://softwarelibre.cl/print.php?sid=175>
- SMITH Bradford (2002), The Future of the software: enabling the marketplace to decide. – Robert Hahn (ed.), *Government policy toward open source software*. Brookings.
- Stats (2003), *Free and open source software*. Statskontoret, Sweden.
- STOCKING Ben (2003), Vietnam embracing open-source products. – *The Mercury News*, October 30, 2003. – URL (retrieved December 12, 2003):
<http://www.siliconvalley.com/mld/siliconvalley/business/columnists/gmsv/7139304.htm>
- Teknologirådet (2002), *Open source software in e-government: analysis and recommendations drawn up by a working group under the Danish Board of Technology*. Danish Board of Technology.