Use and Production of FLOSS in Brazilian Government: an Wide Survey

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***Abstract*—This article presents a quantitative and qualitative exploratory research on the use and production of free/libre and open source software (FLOSS) by Brazilian federal government institutions. 167 federal institutions were interrogated through the Brazilian government's Integrated Ombudsman and Access to Information Platform, Fala.BR, and other specific eletronic information request forms between 2018 and 2020. This is the most extensive survey on the results of 13 years of federal policies to encourage the use of free software in Brazil. This research shows which are the most used software and software categories, the licenses that occur the most, the biggest FLOSS users in the government and which free and open source software were produced and by which institutions.**

***Keywords*—Brazil; electronic government; free software; public software; survey**

I. INTRODUCTION

In 2003, President Lula published a decree that instituted, among others, a technical committee for the implementation of free software in the Brazilian federal government (CISL) [1]. In the same year, this committee established 20 guidelines for the implementation of free software in the Federal Government [2]. One of the objectives defined by the committee was to make free software a standard corporate tool of the federal government. In addition, the committee defined 13 indicators to monitor implementation, including the percentage of systems and services developed using free and open software and the percentage of proprietary licenses replaced.

A few months before the publication of the decree, the Federal Data Processing Service (SERPRO), the largest state-owned information technology company in Brazil, had registered the domain softwarelivre.gov.br, which initially served as a mirror for the website of the Institute of Information Technology (ITI) [3]. As of March 2004, the domain softwarelivre.gov.br started to publicize the actions of the Brazilian government in promoting the use of free software by the federal public administration. One of the first actions carried out was the training of 1000 public servants in courses on software management, support and applications, databases and infrastructure and software development, all covering free and open source software [4].

An Oracle executive stated in 2006 that Brazil was "one of the main candidates in the world to become a center for the use and dissemination of open source systems" [5]. In fact, in 1999, from a Unix/Linux specialization center located in the city of Recife, SERPRO started to migrate workstations with Windows to Linux and from Microsoft Office to the free and open alternative StarOffice [6]. Thus, when President Lula's decree was published, there was already experience in the federal government regarding the migration from proprietary software to free and open source software. Brigadier Tercio Pacitti, a computing pioneer in Brazil, noted that European governments were already encouraging the use of free and open software in their administrations, not only to save on licenses, but to counterbalance US technology dominance and promote a most powerful local software industry [7]. Thus, Brazil was not alone in the initiative to invest in the widespread adoption of free and open source software.

In 2010, CISL published a survey of the use of free software in the federal public administration [8]. This survey measured the adoption of five categories of free and open source software in 129 federal institutions. The categories surveyed were: Electronic Mail Systems; Internet Servers; Information Systems; Work Stations; Office Suites. The results revealed that adoption was higher among universities and lower among agencies, banks and foundations. In 2011, however, the Brazilian Association of Software Companies (ABES) criticized the policy to encourage free and open software:

For the first time the study provides an assessment of the participation of free software in the Brazilian market. After a decade of ostensible support of many representatives of public administration, especially from the federal government, and billions of dollars used in this model, the participation of free software in the Brazilian market in 2010 was only 2.95%, equivalent to US$ 560 million. The production model of open source software in cluster scale does not generate relevant innovation without the support of public resources, is more labor-intensive, pays less in the entire production chain, is not self sustainable and would be virtually nonexistent in terms of GDP if the government did not play the role of its main protagonist. Another great discomfort for the sector is the Public Software Portal, where over 50% of the downloads are made by international competitors, donating technology and knowledge developed with public resources, harming the interests of the balance of trade and Brazilian companies in the country and abroad. [9]

There are some flaws in ABES's criticisms, the first of which refers to the assertion that half of the downloads of the Public Software Portal, a repository of free software created by public institutions, were made by international competitors. The Ministry of Economy, the current manager of the Portal, stated, in response to the request by the Fala.br system, that there was no control or registration of the origin of downloads. In addition, several ABES members are subsidiaries of foreign companies, which are international competitors. Finally, the researcher Silvio Meira states that "all global software-as-a-service platforms are already based on free software, on open software. If you look at the software released by Google, Microsoft, Facebook, Amazon, which is on the internet to be used, it created the capacity to do almost anything" [10].

Anyway, after 2010 no survey was carried out on the use or production of free and open source software in the federal government and from 2016 onwards, the policy to promote free and open software began to be abandoned. One of the symbols of this abandonment is the unavailability of the federal government's free software portal, www.softwarelivre.gov.br. Today it only shows a default page from the FLOSS web server Zope. We only have access to previously published content thanks to the Internet Archive, which stores multiple copies of the portal.

In this article, we surveyed the use and production of free software by 167 institutions of the Brazilian federal government, in order to understand the legacy of the institutionalized FLOSS adoption policy since 2003. Next, we explain the methodology used.

II. METHODOLOGY

The CISL survey, carried out in 2010, showed the adoption of free software considering five categories:

- Data not provided / Not applicable;
- No significant use of Free Software;
- Little use or beginning of migration process to Free Software;
- Medium usage or in process of migration to Free Software;
- Significant Use of Free Software.

This categorization considers the migration from proprietary software to free and open source software. In our survey, we didn't consider migration, just usage. Thus, we asked the institutions to inform which free software they used. After receiving the answer, we checked if the software informed was really free, looking for the source code repository and its license to use. Then we grouped the software into more specific categories than those considered by CISL, according to the purpose of the software. The definition of the categories was made by reading the software documentation and by the information from the user institution, which was also asked about the purpose of the software.

A big difference between the CISL survey and ours is the identification of free software produced by government institutions. We asked each institution if it had produced free software and which ones. As with the question about usage, we sometimes had to make more than one request, as the institution replied that it used or had produced it, but did not inform the names of the software.

Finally, the institutions answered whether the purchase of proprietary software was made even if there was an equivalent free and open software, that is, with the same functionalities.

The questions were submitted to institutions linked to the executive branch of government through Brazilian government's Integrated Ombudsman and Access to Information Platform, Fala.BR. Information requests to the Chamber of Deputies, Federal Senate and Federal Supreme Court were made using electronic forms available on the respective websites of each institution.

The general text of request was this:

I request the following information:

- *What are the free software used by the [name of institution] and what are they used for?*
- *Does [name of institution] buy proprietary software even if equivalent free software is available?*
- *Has [name of institution] developed any free software?*

Sometimes it was necessary to turn to a higher institution to obtain the information, as the institution being questioned refused to provide the data, alleging security. The submissions started in 2018 and the last answers and the analysis finished in 2020. Now we present the results.

III. RESULTS

A. Amount of FLOSS users

Requests for information were submitted to 167 Brazilian federal institutions. Table I shows the 10 biggest users of FLOSS in Brazilian Government. The first one is SERPRO, the largest state-owned information technology company in latin america with units spread across several Brazilian states. There are two federal institutes, which are vocational training schools, and three universities among the biggest users. The oldest state-owned bank in Brazil also appears on this table, as the Ministry of Economy.

TABLE I
THE 10 BIGGEST FLOSS USERS IN THE BRAZILIAN GOVERNMENT

Institution	Amount
Serviço Federal de Processamento de Dados	194
Câmara dos Deputados	141
BANCO DO BRASIL	129
Instituto Federal de Educação, Ciência e Tecnologia do Mato Grosso do Sul	121
Instituto Federal de Educação, Ciência e Tecnologia do Triângulo Mineiro	97
Ministério da Economia	88
Agência Nacional do Cinema	79
Universidade Federal de Alfenas	76
Universidade Federal de Minas Gerais	73
Universidade Federal de Santa Maria	67

It is important to understand that the **amount** refers to the different softwares used, not the quantity of copies. We did not asked how many copies had been installed.

Table II shows the 10 universities that use FLOSS the most. The first two ones are from the same state, Minas Gerais, in the southwest region of Brazil. Each region of the country has at least one university on this table. The average amount is 55.

TABLE II
THE 10 BIGGEST FLOSS USERS AMONG THE BRAZILIAN PUBLIC UNIVERSITIES

University	Amount
Universidade Federal de Alfenas	76
Universidade Federal de Minas Gerais	73
Universidade Federal de Santa Maria	67
Universidade Federal de Ciências da Saúde de Porto Alegre	64
Universidade Federal de Goiás	60
Universidade Federal do Estado do Rio de Janeiro	47
Universidade Federal do Oeste do Pará	45
Universidade Tecnológica Federal do Paraná	41
Universidade Federal do Oeste da Bahia	39
Universidade Federal de Mato Grosso do Sul	38

Table III shows the 10 federal institutes of education that use FLOSS the most. Three of the ten are from state of Minas Gerais. The average amount is 44.7. We can see that first place is almost three times greater than average, while the last place is almost three times less than average.

TABLE III
THE 10 BIGGEST FLOSS USERS AMONG THE BRAZILIAN FEDERAL INSTITUTES OF EDUCATION

Federal Institute	Amount
Instituto Federal de Educação, Ciência e Tecnologia do Mato Grosso do Sul	121
Instituto Federal de Educação, Ciência e Tecnologia do Triângulo Mineiro	97
Instituto Federal de Educação, Ciência e Tecnologia do Acre	55
Instituto Federal de Educação, Ciência e Tecnologia de Minas Gerais	47
Instituto Federal de Educação, Ciência e Tecnologia do Mato Grosso	27
Instituto Federal de Educação, Ciência e Tecnologia da Bahia	22
Instituto Federal de Educação, Ciência e Tecnologia do Norte de Minas Gerais	22
Instituto Federal de Educação, Ciência e Tecnologia da Paraíba	21
Instituto Federal de Educação, Ciência e Tecnologia do Rio Grande do Norte	18
Instituto Federal de Educação, Ciência e Tecnologia do Amazonas	17

As with the federal institutes of education, there is also a disparity in the amount of software used in the ministries, as we can see on the Table IV. The average amount for ministries is 31.1. Observe that first ministry on the table uses almost three times as much FLOSS greater than average, while the last ministry is almost two times less than average.

TABLE IV
THE 10 BIGGEST FLOSS USERS AMONG BRAZILIAN MINISTRIES

Ministry	Amount
Economy	88
Science and Technology	36
Health	29
Regional Development	29
Citizenship	28
Defense	26
Tourism	20
Agriculture	20
Education	18
Mines and Energy	17

Table V shows the 10 state-owned enterprises that use FLOSS the most. Three of the ten are information technology companies: SERPRO (first), DATAPREV (sixth) and BB Tecnologia (seventh). The average amount is 59.5. We can see that first place is almost three times greater than average, while the last place is almost four and a half times less than average.

TABLE V
THE 10 BIGGEST FLOSS USERS AMONG STATE-OWNED ENTERPRISES

Enterprise	Amount
Serviço Federal de Processamento de Dados (SERPRO)	194
BANCO DO BRASIL	129
Petróleo Brasileiro S.A.	51
Companhia Nacional de Abastecimento	50
Empresa Brasileira de Pesquisa Agropecuária	40
Empresa de Tecnologia e Informações da Previdência (DATAPREV)	39
Petrobras Transporte S.A	34
BB Tecnologia e Serviços	30
Companhia de Entrepostos e Armazéns Gerais de São Paulo	15
Empresa Gerencial de Projetos Navais	13

In the legislative power, the disparity between the Chamber of Deputies and the Federal Senate is greater than that found among instances of federal institutes, ministries and state companies. While the Chamber of Deputies uses 141 FLOSS, the Federal Senate uses only 1. The Supreme Court uses 5 free and open source softwares.

Table VI shows the amount of FLOSS used by each one of the categories of government institutions. We can see that public universities are the biggest users. Together they use almost twice as much as the second category, the state-owned enterprises. In fact, the institutions linked to the executive branch of the Brazilian republic constitute the overwhelming majority of free and open source software users.

TABLE VI
THE FLOSS USERS BY CATEGORY OF GOVERNMENT INSTITUTION

Category	Amount
Universities	1341
State-owned enterprises	682
Federal institutes of education	670
Ministries	349
Agencies	296
Legislative power	142
Others	39
Research centers	10
Judicial power	5

B. Amount of used FLOSS

Of 1019 softwares reported by institutions in response to requests, we found that 755 (74%) had use licenses adhering to the definitions of the Free Software Foundation for free software or of the Open Source Initiative for open source software. Table VII shows the most used softwares. On this table we can see three operating systems (Ubuntu, CentOS and Debian) and two relational database management systems (PostgreSQL and MySQL).

TABLE VII
THE 10 MOST USED FLOSS IN BRAZILIAN GOVERNMENT

Software	Users
LibreOffice	88
Ubuntu	85
PostgreSQL	77
Apache (HTTP Server)	67
MySQL	67
CentOS	63
Zabbix	62
Debian	58
Mozilla Firefox	43
GitLab	42

Table VIII shows the amount of category softwares. This table shows that there is more operating systems and database management systems than those that appear on the Table VII. In addition, table IX shows the most used operating systems.

TABLE VIII
THE 10 MOST USED FLOSS CATEGORIES IN BRAZILIAN GOVERNMENT

Category	Users
Operating System	283
Database Management System	227
Web Application Server	221
Integrated Development Environment	165
Monitoring	143
Office Suite	103
Control Version System	96
Content Management	88
Development Framework	81
Project Management	80

TABLE IX
THE 10 MOST USED FLOSS OPERATING SYSTEMS IN BRAZILIAN GOVERNMENT

Operating System	Users
Ubuntu	85
CentOS	63
Debian	58
Mint	18
Red Hat Linux	13
FreeBSD	12
Oracle Linux	9
Fedora	8
SUSE Linux	8
Linux	4

Table X shows the 10 most found FLOSS licenses. We can see that the GPL family licenses of Free Software Foundation predominate among the licenses.

TABLE X
THE 10 MOST FOUND FLOSS LICENSES

License	Softwares
GPL-2.0	783
GPL	520
Apache 2.0	512
GPL-3.0	306
MIT	184
LGPL-3.0	134
LGPL	132
AGPL-3.0	108
PostgreSQL	100
Eclipse	93

An additional result about the most used FLOSS are the programming languages, or in fact, the FLOSS compilers and interpreters. Among the 20 most used FLOSS, we found two programming languages: Java (OpenJDK) and PHP.

C. Software acquisition policy

More than half of the institutions did not answer what their policy is on the purchase of proprietary software. The majority of those who responded stated that the acquisition was based on a technical evaluation and, therefore, only if there was no free software with the same functionalities. This answer, in fact, showed that these institutions did not understand the question, as it referred to the situation in which there is a proprietary software and a free software with the *same* functionalities. Table XI shows the answers distribution.

TABLE XI
POLICIES FOR BUYING PROPRIETARY SOFTWARE

Policy	Answers
Buys proprietary software and don't justify	16 (9.58%)
Justifies the purchase of proprietary software	2 (1.2%)
Did not provide an answer	96 (57.49%)
Purchase depends on technical evaluation	53 (31.74%)

D. FLOSS production

14 institutions (8.38% of total) answered produced some FLOSS product. But, in fact, 12 of them are effective FLOSS producers. The biggest producer is an educational institution, the federal institute of Minas Gerais, one of the 10 biggest FLOSS users among the Brazilian federal institutes of education.

TABLE XII
EFFECTIVE FLOSS PRODUCERS IN BRAZILIAN GOVERNMENT

Institution	Amount
Federal Institute of Minas Gerais	13
DATAPREV (Social Assistance)	11
EMBRAPA (Agroresearch)	4
SERPRO (IT company)	4
Chamber of Deputies	3
Agência Nacional de Saúde Suplementar (Agency)	1
BANCO DO BRASIL (Bank)	1
Companhia Nacional de Abastecimento (Food Supply)	1
Federal Senate	1
Ministry of Economy	1
Ministry of Education	1
Ministry of Environment	1

The producers with the most organized pages for free and open software are Federal Institute of Minas Gerais and DATAPREV. You can find their FLOSS products here respectively:

- http://www3.ifmg.edu.br/index.php/software-livre.html
- https://github.com/dataprev

But not all DATAPREV softwares are on Github. Some of them (Cacic, Cocar and SGA) are on the Brazilian Public Software Portal. In this same portal we find Agatha, software developed by the Ministry of Economy. The complete catalog of softwares of this portal are available here:

- https://softwarepublico.gov.br/social/search/software_infos.

Unfortunately, most producers don't have an easy-to-access page where they list their FLOSS products. SERPRO, for example, does not have a single page for its 4 softwares, AlienDroid, Demoiselle, ExpressoV3 e Sagui.

Some observations about these producers:

- According DATAPREV, it had 3 softwares in Brazilian Public Software Portal and 14 softwares in Github, however, from these 14 softwares, only 8 of them had FLOSS licenses (it is because of this there are 11 softwares on the Table XII);
- Of 6 FLOSS that EMBRAPA informed that it had produced, 2 of them do not have source code available (it is because of this there are 4 softwares on the Table XII);
- Although Chamber of Deputies also did not informed the name of the softwares, it informed the repositories where we got to find them. There are three repositories of the Chamber in Github, but one of them did not have a FLOSS license;
- Federal Senate informed it had not produced FLOSS, however we discovered from a government webpage that Senate was responsible for leading the development of LexML, a portal with legal and legislative information.

E. Confusions, contradictions and dificulties

We found a lot of confusion in the answers about what is free software and even about what software is. In addition, as mentioned, there was a refusal in some cases to provide information and even contradictory information. Finally, responses came in a variety of formats, such as lists in text files, image files and spreadsheets. We mention some of these cases below:

- 16 communication protocols or technological standards were cited as if they were software. Some examples are: NFS, DNS, DHCP and SMTP;
- The company EMGEPRON refused to inform which Linux distributions it used. To address this case in the survey we considered a generic Linux as a distribution;
- In fact, 4 institutions did not inform the Linux distributions they use. In addition to EMGEPROM, the National Civil Aviation Agency, the Federal Institute of Piauí and the Federal University of Acre also did not inform their distributions;
- BB Tecnologia, an information technology state-owned enterprise, informed that had produced FLOSS, but it did not informed the names of them. When we asked for this information, in a second request, the company answered that it does not develop applications under the definitions of the Free Software Foundation, which contradicts its first answer.
- PETROBRAS said that he sent a spreadsheet that he didn't. When he sent the spreadsheet, after a new request, there were 21 pages of software lists, where there was no distinction between free and non-free software, but there was information about the supplier. Those software that were identified as proprietary through the supplier's information were eliminated and we requested a clarification on some software that left doubts. When the company provided the clarifications, some information was inconsistent: OpenScape and OPNET were not found on the website of The Document Foundation, mentioned as a provider. Openpredictor was also not found on the Rovising Dynamics website and Openwire was not found on the Landmark website;
- As mentioned earlier, the Federal Senate stated that it did not produce free software, and added that it does not disclose the production of software for security reasons. However, we find that there is public information about software produced by the Senate;
- The Federal Institute of Ceará replied that it was not feasible to list all free programs used in the institution;

- The Federal Institute of Mato Grosso responded that it uses various software, but that it does not have a record of what is used on its campi, as the administration is decentralized due to the autonomy of the campi. We sent requests to the 19 campuses, but only 3 answered: Confresa, Diamantina and Parecis;
- The Federal Institute of São Paulo informed that the software it produced was available in a Gitlab repository accessible over the Internet, but this repository has restricted access to registered users;
- Instituto Federal Sul-Rio-Grandense replied that software it produced are open source, and are shared in the federal education network, but are not classified as free software;
- The Federal University of Acre contradicted itself, claiming first to use Linux and then saying that it didn't.

F. Transparency of the results

All requests for information made by the Fala.BR system are available to the general public, not only to those who requested information. Thus, all data used for this article are available for consultation at this adress: http://www.consultaesic.cgu.gov.br/busca/SitePages/Principal.aspx.

IV. CONCLUSION

Although journalist Luiz Queiroz announced the death of free software in the Brazilian government in 2016 [11], the fact is that Brazilian government continues to use FLOSS. The "death year" for FLOSS in Brazil is the year when CISL was formally extinct [11]. However, it seems that CISL left a legacy. We have discovered from this survey that 755 free and open source softwares are used by federal government institutions. In addition, 12 of these institutions produced 42 free and open source softwares that are still available.

This survey increased knowledge about the use of free software in the Brazilian government compared to the survey carried out in 2010 by CISL. The number of institutions surveyed increased from 129 to 167. We expanded the knowledge of the use of software categories for the use of each specific software.

Through the responses of the federal institutions interrogated, we could found that there is no uniform software control among them. Some of the institutions identifies softwares according their licenses, other ones mix softwares without price with free and open source softwares and, finally, some of them do not separate FLOSS from proprietary softwares. It seems that CISL, throughout its existence, did not get to guide or to convince the federal institutions to define a control about the licenses of softwares to facilitate the inventory of free and open source software.

One of the results of CISL's work could have been the definition of a standard page for all institutions that would inform the catalog of free and open software, such as the one found at the Federal University of Minas Gerais (UFMG):

- https://www.ufmg.br/dti/pagina-inicial/portfolio/catalogo-de-softwares-publicos-e-softwares-livres/

This survey would probably have been carried out in a shorter time if this instrument had been provided by all the institutions interviewed. It is worth mentioning that the Brazilian federal government has a page with proprietary software catalogs for purchase:

- https://www.gov.br/governodigital/pt-br/contratacoes/catalogo-de-solucoes-de-tic

Some of the software catalogs maintained by the government on the aforementioned page are products of big information technology companies of USA, several of them users and developers of free and open source software, such as Microsoft, Oracle, IBM and Red Hat. The first three companies have subsidiaries as members of the Brazilian Association of Software Companies (ABES), the same one that criticized the Brazilian policy of promoting FLOSS in 2011.

As we mentioned in the introduction, one of the objectives defined by CISL was to make free software a standard corporate tool of the federal government. Fact is that support for free software in the Brazilian federal government depended a lot on decrees, which are easily revoked when the head of the executive branch is changed. In 1999 a bill project was presented to regulate the use of open source programs by the public administration [13]. This bill project was archived in 2019, thus burying the possibility of FLOSS becoming a standard in the government by force of law.

Although it has not become a standard, free and open software is present in Brazilian federal government institutions through the various instances installed over the years. Once we know, through this study, which institutions use free software and which software is used, including those produced by some of these institutions, we can prepare more specific studies on each of these software. These studies can focus on the relationship of these software with digital inclusion policies or on the formation of communities of users and government developers around the software. This is a proposal for future studies.

REFERENCES

[1] SILVA, Luiz Inácio Lula. MANTEGA, Guido. *Decreto de 29 de Outubro de 2003*. http://www.planalto.gov.br/ccivil_03/dnn/2003/dnn10007.htm. Accessed on 17 sep. 2021.

[2] BRASIL. *Planejamento Estratégico 2003 – 2004: diretrizes, objetivos e ações prioritárias*. 2003. hhttp://bvsms.saude.gov.br/bvs/publicacoes/planejamento_estrategico_2003.pdf. Accessed on 17 sep. 2021.

[3] REGISTRO.BR. *Domínio softwarelivre.gov.br*. https://registro.br/tecnologia/ferramentas/whois/?search=softwarelivre.gov.br. Accessed on 17 sep. 2021.

[4] INTERNET ARCHIVE. *Governo Federal prepara a 1ª Semana de Capacitação e Desenvolvimento em Software Livre*. https://web.archive.org/web/20040321114829/http://www.softwarelivre.gov.br. Accessed on 17 sep.

2021.

[5] INTERNET ARCHIVE. *Brasil é prioridade em Código Aberto*. https://web.archive.org/web/20070123140250/http://www.softwarelivre.gov.br/noticias/News_Item.2006-11-01.3556. Accessed on 17 sep. 2021.

[6] FOLHA ONLINE. *Serpro instala Linux no Recife e prevê economia de R$ 3,5 mi*. https://www1.folha.uol.com.br/folha/reuters/ult112u20590.shtml. Accessed on 17 sep. 2021.

[7] PACITTI, Tércio. *Paradigmas do Software Aberto*. Rio de Janeiro: LTC, 2006.

[8] CISL. *Status de utilização de ferramentas e soluções desenvolvidas em software livre*. https://web.archive.org/web/20120517081317/http://www.softwarelivre.gov.br/levantamento/levantamento/levantamento. Accessed on 17 sep. 2021.

[9] ASSOCIAÇÃO BRASILEIRA DAS EMPRESAS DE SOFTWARE. *Mercado Brasileiro de Software: panorama e tendências*. São Paulo: ABES, 2011. https://abessoftware.com.br/wp-content/uploads/anterior/Arquivos/Dados%25202011/Mercado_BR2011.pdf. Accessed on 17 sep. 2021.

[10] MEIRA, Sílvio. *Software livre venceu e desapareceu. Agora tudo é serviço*. 2020. https://www.convergenciadigital.com.br/Inovacao/Software-livre-venceu-e-desapareceu.-Agora-tudo-e-servico.-53856.html. Accessed on 17 sep. 2021.

[11] Queiroz, Luiz de. *Software Livre tem data marcada para morrer no governo: 11 de novembro*. http://capitaldigital.com.br/software-livre-tem-data-marcada-para-morrer-no-governo-11-de-novembro. Accessed on 17 sep. 2021.

[12] LIMA, Alberto Jorge Silva de. SOBRAL, André Vinícius Leal. *Tecnologias da Informação e Comunicação e Promessas de Autonomia no Brasil: das Histórias da Política Nacional de Informática à Política de Fomento ao Software Livre*. https://is.cos.ufrj.br/wp-content/uploads/2020/05/Alberto-de-Lima-Andre-Sobral-Tecnologias-da-Informa%25C3%25A7%25C3%25A3o-e-Comunica%25C3%25A7%25C3%25A3o-e-promessas-de-autonomia-no-Brasil.pdf. Accessed on 18 sep. 2021.

[13] PINHEIRO, Walter. *PL 2269/1999*. https://www.camara.leg.br/proposicoesWeb/fichadetramitacao?idProposicao=17879. Accessed on 18 sep. 2021.