

## Toward a Framework for Implementing Open Source Software in Public Administrations: Legal, Economic and Societal Aspects

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**Abstract.** *This research is a first step toward a framework for implementing open source software in public administrations.*

*Based on the analysis of several previous projects of implementation of open source software in the public administrations of European countries – both successful and unsuccessful – it addresses areas crucial for creating well-defined policies and success of implementation: understanding of legal, economic and societal aspects of open source software.*

**Keywords.** Open source software, software licenses, procurement, open source business model, total cost of ownership, training, public administrations, society.

### 1. Introduction

As a software development and licensing model, open source has existed for three decades (albeit under various names and resulting acronyms – *free software*, *software libre*, *OSS*, *FOSS*, *FLOSS*).

Until the late 1990's open source was considered to be a software for hobbyist programmers. The key moment for adopting open source software by businesses and, subsequently, governments, was publishing of the Netscape's source code under open source license in 1998 [13].

While open source software was initially implemented in those environments only on a program-by-program basis, today there are several large-scale implementation projects in public administrations of European countries and elsewhere.

One of the biggest projects of this kind is the migration of desktop computers of the France's Gendarmerie Nationale, the country's national police force, from Microsoft Windows operating

system and Microsoft Office suite to Ubuntu Linux operating system and OpenOffice.org office suite. Based on the success of the pilot migration of 5,000 workstations, Gendarmerie plans to move forward and switch the entire organization, and all 90,000 of its workstations, to the Linux and OpenOffice.org by 2015 [11].

Also well-known is LiMux, project started in 2003 by the city council of Munich to migrate their workstations, including 14,000 laptops and desktop computers of public employees, to open source software. Workstations are migrated to the LinUx operating system (based on Debian GNU/Linux until 2011 and afterward on Ubuntu Linux) and other open source applications, including LibreOffice (OpenOffice.org until 2011) [9].

Multitude of similar projects started in 2011 alone – such as migration of 25,000 computers in 13 hospitals in the Danish capital city of Copenhagen to the LibreOffice office suite [4], migration of 50,000 computers in Portuguese schools to Linux and other open source applications [5], migration of all computers in public sector of Hungary to open source office suites [6], announcement of the migration of public administration to the open source in the Program of the Croatian Government [12] – shows that open source software will play increasingly important role in the public administrations of European countries in the years to come.

All of the above supports the importance of creating the framework that is going to serve as the basis for projects of migration to, or implementation of, the open source software.

### 2. Legal foundations of open source software

Open source software is a software that enables the user to:

- use for any purpose
- study by examining the source code
- modify and improve
- distribute, with or without modifications.

These user's freedoms are elaborated in detail in the Open Source Definition, created in 1998 [20], and maintained since by the Open Source Initiative.

The key to understanding the open source software is the understanding of its legal aspect. This is particularly important for public administrations, since they, when acquiring software, have to follow procurement rules and regulations.

Open source software is copyrighted by its authors, but, unlike proprietary software, it is published, with source code provided, under copyright licenses that are approved as compliant with the Open Source Definition by the Open Source Initiative.

Most open source licenses, including those mentioned in this paper, are based on the international legislation on copyright, which ensures their enforceability in most legal jurisdictions worldwide.

There are two types of open source licenses: copyleft and permissive. Both types of licenses have certain advantages, so a license can be an important factor when choosing an open source program for a specific task.

## 2.1. Copyleft licenses

The main characteristics of copyleft licenses are the following: they allow binary redistribution, but only if source code availability is also guaranteed, they allow source redistribution – and enforce it in case of binary distribution, they allow modification of the software (if the derived source code is also covered by the same license), and complete integration with other software is only possible if that other software is also covered by the same license [15].

Also, some copyleft licenses, commonly called weak or partial copyleft licenses, exempt the source code from some usual copyleft provisions, allowing distribution of some modifications under terms other than that of the copyleft license.

The most popular copyleft license is the GNU General Public License (GPL), which is, in its various versions, used by 48.83% of open

source projects [17]. Also popular are some weak copyleft licenses, such as Lesser General Public License (LGPL), Mozilla Public License (MPL) and Common Development and Distribution License (CDDL). European Commission has created its own copyleft open source licence – European Public Licence (EURL) [16].

Prominent examples of open source software released under copyleft licenses are Linux, MySQL, LibreOffice and Mozilla Firefox and Thunderbird.

Decision to use software released under copyleft license ensures that all future versions of the same application will be available as open source, but it also imposes the aforementioned restrictions to the user.

## 2.2. Permissive licenses

Permissive licenses impose almost no conditions on what a user can do with the software, including charging clients for binary distributions, with no obligation to include source code. Re-distributors can do almost anything with the source code, including using it for creating proprietary applications. The only obligation of the distributor is to recognize the author's work. Permissive licenses do not include any restrictions oriented toward guaranteeing that derived works remain open source [15].

Permissive licenses can be very short and simple, which makes them popular among software developers who do not want to deal with licensing.

The most popular permissive licenses are MIT license (used by 11.47% of open source projects), BSD license (6.81%) and Apache license (5.48%) [17].

Prominent examples of open source software released under permissive licenses are FreeBSD, PostgreSQL, Apache HTTP Server, Android, Perl, Python and PHP.

Use of software released under permissive license enables user to be more flexible, but it gives no guarantee that future versions of the same application will be available as open source.

## 2.3. Multi-licensing

A widespread model of licensing open source software is multi-licensing, a practice of

licensing an application under multiple licenses. Multi-licensing enables re-distribution of source code and modifications under any one of the offered licenses.

Multi-licensing has become very popular lately, as it enables software companies to offer enhanced versions of their own open source applications in commercial versions, under proprietary license. It gives flexibility to the users and software developers and reduces problems caused by incompatibility between licenses.

Prominent examples of multi-licensed programs are Mozilla Firefox and Thunderbird (GPL, LGPL and MPL), MySQL (GPL and proprietary End-user license agreement) and Qt toolkit (GPL, LGPL and proprietary End-user license agreement).

## 2.4. Procurement of open source software

Given the specifics of open source, acquiring open source software is significantly different from acquiring proprietary software [3]. While proprietary applications must go through procurement, acquisition of open source software, however, is usually done by downloading software from websites. Also, open source software by default comes without a price.

There are no official laws concerning procurement of open source software on European level, but taking into account that open source comes without price, and that open source licenses do not require agreeing to any kind of contract by the user (at least not when the software will only be used and not further distributed), there is no reason to go through procurement procedure according to laws and rules when acquiring open source software. As a result, open source software can significantly simplify the acquiring of the software in public administration.

Of course, when acquiring commercial services related to the open source software (e.g. user support or maintenance services for an open source operating system or database), standard procurement regulations still apply.

## 3. Economics of open source software

For someone who has so far only used proprietary software, business model and economics behind open source software may

seem confusing. On the one hand, open source business model can appear as unsustainable and unreliable, while on the other hand it is easy to fall into the trap of thinking about open source software as completely free and as a way to quickly achieve big savings.

Both opinions are superficial and, ultimately, incorrect.

Therefore, when considering implementation of open source in public administrations, it is necessary to understand business model behind the development of open source software and the costs of using it.

### 3.1. Open source business model

From the viewpoint of the development process, there are three kinds of open source software: software developed exclusively by the community of enthusiast programmers, software developed by the software companies and software developed in cooperation of companies and enthusiasts.

Enthusiast programmers are obviously not motivated by profits (at least not in the short run). Their incentives are less obvious: self-improvement, desire for peer recognition, future job offers [8], personal practical interest (as a user of the application) and enjoyment of programming [19].

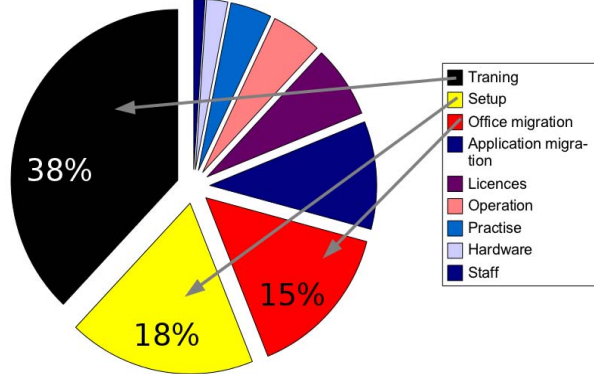
Software companies are, naturally, motivated by profits. However, unlike manufacturers of proprietary software, companies that produce open source software do not rely on profits from selling software licenses, and therefore the business model behind open source software is based on selling support services to the end-users of the software. Although this may seem as an unreliable source of revenues, it should be noted that Red Hat, company behind the enterprise-class Linux distribution Red Hat Enterprise Linux, has posted \$909.3 millions in revenues for the fiscal year 2011 [14].

### 3.2. Costs of using open source software

Taking into account the fact that acquiring open source software does not bring any direct costs, it is necessary to analyze other costs of using open source software. Although there are no costs related to licensing, the total cost of using open source software – or, as is commonly said, the *total cost of ownership* (TCO) – of course, is not equal to zero.

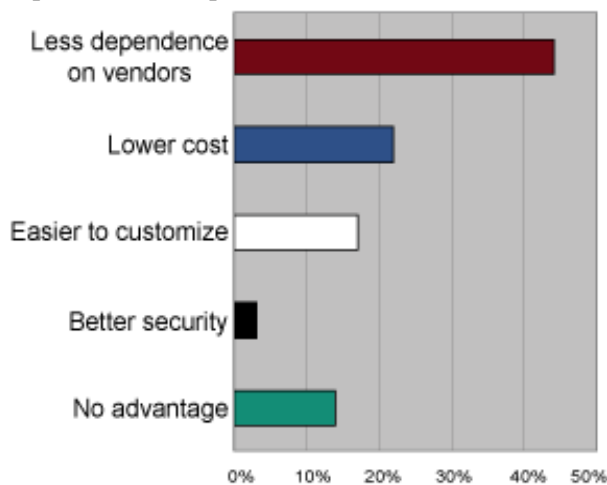
To be precise: open source software is free for download, installation, and licensing, but the costs in terms of skills and maintenance still exists.

According to the estimate by the LiMux project in Munich, shown in *Figure 1*, around 90% of costs are related to organizational aspects of the project, of which 38% are the costs of training [9].



**Figure 1. The LiMux project in Munich: estimated costs after detailed conception [9]**

LiMux and other similar projects, such as migration of 1,800 personal computers in several municipalities of the Province of Bolzano-Bozen, Italy, to OpenOffice.org office suite in 2003 [21], have showed that personnel training is the crucial factor for the success of the implementation, since open source software to a greater extent than proprietary software depends on the existence of trained personnel, especially if there is no external support from specialized companies.



**Figure 2. What is the most important advantage in the use of open source? [7]**

While it is possible that the costs of personnel training, commercial support and maintenance can be higher for open source software, than for the proprietary software [10], the TCO shall, in most cases, be considerably lower for open source software.

But the key factor when considering cost, is that the lower cost is not the most important advantage of open source software. As shown in *Figure 2*, research conducted in 2005 concluded that only 22% of the users perceive lower cost as the most important advantage in the use of open source software [7].

#### 4. Societal aspects

Societal aspects of open source are an area where open source software is perhaps the most different from proprietary software. It is also an area that is least researched.

While proprietary software is simply a product that is bought and used within the limitations set by the manufacturer, open source software can be a mechanism of social change.

For starters, a prerequisite for the successful implementation of open source is a workforce ready for continuous learning and professional improvement, since open source software often requires a higher level of self-sufficiency of software users, than in the case of proprietary software.

From the viewpoint of software development (in both business and public sectors), open source promotes cooperation and sharing. Companies that are competing in providing support for the same open source application, often collaborate on its development, since the quality of the application is in the interest of both companies.

Also, open source software can be seen through the prism of achieving some of the key principles of modern democratic society and meeting the obligations of government institutions toward the citizens and taxpayers. Some specific needs – both technical and political – of the public administrations can be met by the open source software [3]:

- transparency
- independence
- interoperability
- flexibility

Transparency of the government ICT systems can be increased by using open source

software, as its processes can be examined in detail.

Every open source application, even if it does not provide interoperability, provides indirect support for interoperability, as it can be studied and adapted to work with different systems – thanks to the availability of source code and licensing terms.

Independence and avoiding of the vendor lock-in is achieved through the licensing of open source software [2].

Flexibility is a result of the source code availability and the right to freely modify it and adapt it when user needs change.

These four characteristics guarantee the sustainability of open source software, which in turn implies lower costs over the longer term and – more importantly – reduces the reliance on the original vendors of the software [3].

## 5. Comprehensive approach

LiMux Project [9] and migration of France's Gendarmerie Nationale [11] to open source software are two most well known examples of successful migration to open source in the public sector.

Less well known are unsuccessful projects, since no government advertises its failures. Example of such projects are failed migrations of local public administrations of Paris [18] and Vienna [1].

What is common to successful projects is thorough planning, graduality, and existence of clear and comprehensive policy, based on understanding of all aspects of open source software. On the other hand, unsuccessful projects are characterized by poor planning and hastiness.

## 6. Conclusion

The precondition for successful implementation of open source software is a clear legal treatment of open source software. Achieving this has been greatly facilitated by the fact that most open source licenses are based on the international legislation on copyright, which ensures their enforceability in most legal jurisdictions worldwide. However, legislation that would explicitly clarify that and other issues, such as the issue of procurement of open source software, would further simplify the

implementation of open source software in public administrations.

While it is common to view open source primarily as free (as in no-cost) and to ignore its other characteristics, price should not be the only factor when considering the implementation of open source software in public administrations.

Potential social benefits of using open source include greater involvement of citizens in the process of lifelong education and development of business culture based on cooperation. It also enables public administrations to fulfill their specific needs – transparency, interoperability, independence and flexibility – through the use of open source software.

For a successful implementation of open source software in public administration, it is crucial to create a clear and comprehensive policy as a foundation, based on the thorough understanding of all aspects of the open source software and the implementation process itself: legal, economic and societal.

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