Barcelona Ciutat Digital

# Barcelona City Council technological sovereignty guide

**The Open Digitisation Programme from Barcelona City Council's Office for Technology and Digital Innovation**

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# 1 Introduction and context

## OBJECTIVE

This document will act is a **supporting document** for the **Code of Technological Practices** that puts the concept of technological sovereignty into practice, expanding on the principles that govern the new directorate at the Barcelona Municipal Institute of Information Technology (IMI) in terms of technology and innovation: interoperability, agility, reuse, ethics and making knowledge and technologies more open.

This document seeks to assist the IMI in implementing the strategic approach of the Barcelona City Council, which involves rolling out **open technologies and software** for most of its technological processes and services. This principle of technological sovereignty, combined with the **agile methodology for developing services and responsible data management**, form the basis of the medium-term vision for the agile digital transformation in the city of Barcelona.

According to the Paris Declaration on the Open Government Partnership, free software (open source code) "*contributes to fostering transparency and collaboration. Source code is at the heart of digital and technical innovation. It is the primary means to providing high quality digital services. Partners joining will seek to promote transparency and accountability of open source code and algorithms they develop and use, wherever possible and appropriate. Partners joining will seek to design and implement them in non-discriminatory manners, and work towards maximizing the benefits of government code sharing and reuse.*"[1]

Therefore, an important objective of this document is to help participants and those interested in the digital services of the Barcelona City Council to work with open technologies, solutions and projects; to understand the rights and duties resulting from free licences; to promote the development, acquisition, use and release of software; to ensure that its advantages are harnessed and to eliminate any reluctance that may exist due to the lack of knowledge around the various technical, organisational and legal aspects.

## AREA OF APPLICATION

This document will be applied to the management and governance of new digital service projects that fall within the Barcelona City Council's digital transformation plan.

[1] *Paris Declaration for Open Government Partnership; available online at https://paris-declaration.ogpsummit.org/topic/5820e48c2fd812b46ab9facc*

# 2 General Principles of Technological Sovereignty

On 6 October 2016, the Commissioner for Technology and Digital Innovation presented the 2017–2020 Digital Barcelona Plan: Transition towards technological sovereignty, the goal of which is "to resolve the challenges of the city and its citizens through a more democratic use of technology. Boosting technological and digital innovation, for a more open government, as a tool for developing a plural economy that promotes social and environmental transformation and that promotes citizen empowerment".

The Plan, structured around three axes, demonstrates Barcelona's desire to lead the transition towards technological sovereignty, a technological sovereignty of government and citizens that enables them to participate in the decision-making process and take action concerning the technological priorities and strategies in use throughout the city. In particular, in terms of the government and city, the Plan focuses on an open and efficient government that uses technology to transform and digitally innovate the public sector based on open source software and open standards. Furthermore, the aim is to set up an open public data infrastructure to develop innovative data-based applications.

According to the Government Measure, technological sovereignty of government and citizens will make it possible to determine and take action concerning the priorities in the use of technology, make decisions about how to develop our city and regain knowledge of the city's management using technological tools — knowledge that, to date, was held by just a few companies for the most part. This sovereignty will make it possible to leave this knowledge as a lasting legacy for the city. In addition, this technological sovereignty, promoted using open standards, must be a tool for the common good that generates a new economy and also makes knowledge-sharing possible between different cities.

Within the framework of this plan, in addition to designing public services as "digital services by default", placing citizens at the centre of the design process and contributing public value, services must be built in the most agile and open manner possible; they must be simple, modular and interoperable to avoid dependencies on vendors and providers of specific proprietary solutions. Consequently, the use of free software and open standards must be prioritised.

The Measure establishes the "transition towards open source and standards" as one of the most important activities: the transition towards free software and open standards, through the exploration of the best Spanish and European practices in this field. To this end, a migration plan and a code of best practices for technology will be defined and established to guide the internal transformation, the reuse and sharing of the software with third parties and the development and use of shared government solutions.

For these reasons, technological sovereignty within the 2017-2020 Digital Barcelona Plan is structured around three fundamental principles:

- The transition and use of free or open source software
- The interoperability of services and systems
- The use of open standards

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# Free or open source software

## 3.1. Concept and definitions

The general principles underpinning free or open source software are the concepts of freedom and access, basic principles of technological sovereignty: freedom to use software and access to the source code in order to benefit from this freedom.

Free software is no different from other software in terms of its technical properties, although it is usually developed in a different manner. Its distinguishing features are mainly its legal characteristics and the conditions of use and (re)distribution defined in the corresponding licence. The use of free software is not subject to the same rules as traditional "proprietary" software for which a licence is required; these licences tend to establish strict limitations on the use of the software in question (per device, per installation or user name, per CPU, depending on the amount of data processed, etc.). As a result, separate licences must be "bought" for their different uses.

Free software differs from proprietary software in terms of the rights and "**freedoms**" awarded in the corresponding licences ("free licences" or "open source licences"). In summary, these rights provide for the **free use, copying or modification of software and its redistribution to third parties**, under specific conditions.

A free or open source licence is a licence that guarantees the "freedoms of the software", according to Free Software Foundation (FSF), or that fulfils the guidelines established by the Open Source Initiative (OSI).

The Free Software Foundation defines free software as follows (1986)[2]: *A program is free software if the program's users have the four essential freedoms:*

> ***1.*** *The freedom to run the program as you wish, for any purpose (freedom 0)***.**
>
> ***2.*** *The freedom to study how the program works, and change it so it does your computing as you wish (freedom 1). Access to the source code is a precondition for this.*
>
> ***3.*** *The freedom to redistribute copies (freedom 2).*
>
> ***4.*** The freedom to distribute copies of your modified versions to others (freedom 3). Access to the source code is a precondition for this.

Alternatively, "open source" (or "open source software") corresponds to programs that are distributed under a licence that is free and fulfils the OSI guidelines set out under the Open Source Definition, which brings together and develops these four freedoms[3].

Under this definition, licences must fulfil ten conditions to be considered as open source:

[2] *Definition of free software, https://www.gnu.org/philosophy/free-sw.es.html.*
[3] *Open source definition at https://opensource.org/osd*

**1.** Free distribution: it may be sold or given away.

**2.** Source code: must be included or must be freely available.

**3.** Derivative works: must allow the redistribution of modifications.

**4.** Integrity of the author's source code: licences may require that modifications may only be redistributed in patches.

**5.** No discrimination against persons or groups.

**6.** No discrimination against fields of endeavour: for example, commercial uses must not be excluded.

**7.** Licence distribution: the rights attached to the program must apply to all to whom the program is redistributed without the need for execution of an additional licence by those parties.

**8.** Licence must not be specific to a product: the program may not be licensed only as part of a larger distribution.

**9.** The licence must not place restrictions on other software: the licence must not insist that all other programs distributed on the same medium must be open-source software.

**10.** The licence must be technology-neutral.

These guidelines ensure, amongst other things, that a licence certified as being "open sources" grants to the user the aforementioned rights to exploit the software and, therefore, guarantees that it is on a non **discriminatory** basis and that licensees can **access the source code.**

Legally speaking, there is no difference between the definition of free software and the open source guidelines. This means, in any case and in terms of the licence, that the user can reproduce, transform (improve, adapt, integrate into other programs) and distribute or redistribute the programme and any resulting code for any purpose.

## 3.2. CopyLeft

Free software licences with copyleft go beyond merely guaranteeing the basic four freedoms of the software for licensees or direct users. A licence that awards the aforementioned rights without imposing conditions allows the licensee to include the free software in another software programme and redistribute the result under a restrictive or "proprietary" licence, in such a way that the users of the new programme will not attain any of the freedoms originally awarded. In other words, there is no guarantee that the free software remains "open source". Therefore, a mechanism was required to safeguard this freedom: **copyleft**.

**a)** Use the same free licence for the redistribution of software (both the original unmodified software and any other modification made).

**b)** Provide or offer all users access to the source code.

This dual condition eliminates any opportunity to distribute free software under a proprietary licence. Noticeably, copyleft brings the two fundamental concepts of free software (and technological sovereignty) together: freedom and access.

## 3.3. Free licences

Within the general framework of these freedoms, there are a range of different ways to legally express them. This, together with the variety of additional conditions that may be included, is the reason for there being almost seventy open source licences recognised by the OSI, each with its own specific features. The most important difference can be traced to the redistribution conditions and the extent of copyleft which is usually used as a criteria for classifying or differentiating licences.

**a)** If the program has been licensed under a "**permissive**" license (such as BSD-like or X/MIT licenses), generally speaking, no conditions apply in terms of redistribution, which means it can be mixed with any other software.

**b)** If the program has been licensed under the GPL licence or another licence "**with copyleft**", then the redistribution of the programme or any other derivative or composite work including it, must be subject to the same licence (for example, GPL), and offer the user access to the source code. This ensures that the program remains "free" and cannot be "privatised".

**c)** Some "intermediate" licences or licences with "soft copyleft" (such as the LGPL, MPL or EUPL) make it possible to add or integrate new code into the original code and distribute the combination under a new licence (proprietary or free). However, the original part must be offered under the original licence, normally along with the source code. This is a form of partial *copyleft*.

The most common and well-known licences are as follows:

- Permissive: MIT, BSD, Apache Software License 2.0
- *Copyleft:* GPLv2 and GPLv3, AferroGPL3
- Weak copyleft: LGPL (version 2 or 3), MPL (version 2), CPL (Common Public License)

One way of understanding the difference between permissive licenses and licences with *copyleft* is that they guarantee different types of freedoms:

**a)** A permissive free software licence, such as the BSD or MIT licence, offers developers more freedom, as they can integrate and redistribute the software in deployments under both free and/or proprietary software.

**b)** A free software licence with copyleft offers more freedom to the end users, as they will always receive applications with their source code and under a free software licence.

## 3.4. Advantages

The legal and practical impact of free software licences is an important consideration. The direct consequence of using software under a free software licence (and exercising the rights awarded thereby) is the ability to:

**a)** Freely download and copy the program (often online, free of charge).

**b)** Install software to test it and assess its performance.

**c)** Modify it to adapt it to our needs (or hire a developer/ consultant to do this on our behalf).

**d)** Install it on as many devices as necessary in our business or institution and update it as new versions are released.

**e)** Redistribute it (online or in CD/DVD format, etc.) so that others can benefit from any modification or improvement made. All of the above without having to negotiate a licence with a supplier, sign exclusive support contracts or

calculate the number of devices or users that will use the software in question.

Some of the main indirect advantages of the legal model for free software can be seen below:

**a) Reuse:** the right to run, modify and redistribute the free software implies that there is a much higher degree of use, both in terms of the components and the whole application by the end users, which leads to a much higher degree of efficiency.

**b) Independence:** free access to the source code, along with the right to run and modify it, grants the user a high degree of independence from suppliers, meaning it is easier to demand more quality for the service provided.

**c) Collaboration:** the right to access, execute and modify promotes collaborative software development (among developers who have potentially never met) and user-driven correction of errors.

**d) Service orientation:** since they cannot "sell licences", free software consultancy and development firms tend to base their business on the sale of services (selection, integration and deployment, support and maintenance, training, warranties, etc.).

**e) Communities:** the rights granted by free software licences make for intense use and mass dissemination of free software online (in particular via repositories like SourceForge and GitHub) and promote the creation of communities dedicated to free software projects.

For the purposes of freely distributing free software, no fee is charged: there is little point in setting a price when tomorrow, another user can legitimately publish the software (binary and source code) online for download by other internet users at no cost. This prevents vendors trying to offer free software for a fee. Redhat Inc., for example, can charge for its distribution of GNU/Linux (for example, Red Hat Enterprise) essentially because it offers additional products and services: performance warranties, support services, administrative or installation applications.

**We should share what we're doing whenever we can. With colleagues, with users, with the world. Share code, share designs, share ideas, share intentions, share failures. The more eyes there are on a service the better it gets - errors are spotted, better alternatives are identified, the bar is raised.**

**Much of what we're doing is only possible because of open source code and the generosity of the web design community. We should return the favour.**

*https://www.gov.uk/design-principles#tenth*

# 4 Free Software and the Public Administration

## 4.1. In practice

There are many examples of free software being used and created by public administrations both in Europe and across the world. Munich's migration of its servers and desktops is a very well-known case[4]; but there is a long list of other examples, such as the migration of Linux servers and desktops at Zaragoza City Council[5].

In its *Interoperable Delivery of European eGovernment Services to Public Administrations, Businesses and Citizens* (now known as JoinUp), the European Commission established a open source observatory (OSOR) that collects information about benchmark cases on the adoption of free software in the EU : it reveals that literally thousands of cities and regions have installed and run free software across Europe. JoinUp asserts that more than 15,000 projects are licensed under the EUPL free software licence (see below), the majority pertaining to European administrations. JoinUp has also established a European federation of free software repositories , making it possible to search for and identify existing freely licenced solutions.

The European Commission's free software strategy policy was published in 2014, reinforcing its desire to release free software created by or on behalf of the Commission, in addition to contributing to and participating in development communities.[9]

**The European Commission will further increase the role of open source software for many of its key ICT services and software solutions. The renewed strategy puts a special emphasis on procurement, contribution to open source software projects and providing more open source software in the Commission.**

*https://ec.europa.eu/info/european-commissions-open-source-strategy_en*

[4] *Presentation on the Declaration of Independence: The LiMux Project in Munich, available online at https://joinup.ec.europa.eu/sites/default/files/fe/cb/fa/IDABC.OSOR.casestudy.LiMux.pdf*
[5] *Free software desktop migration, available online at @U[www.zaragoza.es/contenidos/azlinux/migracionescritoriosl.pdf]@ . Further information at https://www.zaragoza.es/ciudad/sectores/tecnologia/swlibre/zo2.htm.*
[6] *Open source observatory, available online at https://joinup.ec.europa.eu/node/26689 en línia*
[7] *More projects licensed under EUPL (15,000 according to GitHub), available online at https://joinup.ec.europa.eu/community/eupl/news/more-projects-licensed-under-eupl-15000-according-github*
[8] *JoinUp: About federated repositories, available online at https://joinup.ec.europa.eu/catalogue/repository*
[9] *EC Open Source Software Strategy, available online athttps://ec.europa.eu/info/european-commissions-open-source-strategy_en*

In Spain, the most notable example of software being released and used is the LinEx project in Extremadura, in addition to the Andalusian code repository (endorsed by Order of 21 February 2005, on the public availability of the IT programs of the Regional Government of Andalusia and its autonomous organisms). Since then, various versions of Linux have been created by the Spanish administrations (including Linkat, for the Catalan educational community[10]). The central Government also maintains a repository of reusable software (at the Technology Transfer Centre[11]) and its own GitHub account.

Barcelona City Council itself has released Sentilo[12], a sensor data management platform, developed for the city, whilst the Catalan Regional Government has released a range of projects, including EinesTIC[13].

## 4.2. Advantages

The advantages of the public administration using free software has been addressed countless times. Without looking further, we would highlight the recommendations proposed to the Spanish Central State Administration on the use of free software and open sources, MAP, in June 2005. In summary, this document outlines the following legal advantages:

**a)** Obtaining sufficient software rights (control, on the one hand, and freedom, on the other) to optimise its management: updates, redistribution, etc.

**b)** Benefiting from the freedom of internal and external copying and redistribution by the public administration.

**c)** Contributing to the pooling and reuse of software amongst public administrations (IDA, national).

**d)** Satisfying the legal framework for public action (effectiveness, efficiency, conversation, security, standardisation and interoperability, access and linguistic respect, reuse of resources).

These advantages have also been studied and presented by Cenatic, the Spanish National Reference Centre for the Application of Open Source Information and Communication Technologies (belonging to Red.es at the Ministry of Energy, Tourism and Digital Agenda), for example, in its publication Diez razones para el uso de software de fuentes abiertas en la educación (Ten reasons to use open source software in education) or Diez razones para que la administración libere software (Ten reasons for the administration to release free software)  it includes the following amongst the list of advantages:

- Independence from the software's manufacturer: thanks to the free licence, public administrations and user companies can control the use of technology and enjoy more freedom in designing their future technology strategy.

- Cost savings: thanks to the sharing, reuse and absence of costs associated with free licences, there are significant savings in terms of the end price of applications, whilst using software that is 100% legal.

[10] *Available online at http://linkat.xtec.cat/portal/index.php*
[11] *Available online at https://administracionelectronica.gob.es/pae_Home/pae_SolucionesCTT/pae_CTT_-__Que_es_.html and the account GitHub available at https://github.com/ctt-gob-es*
[12] *Sentilo Project, available online at www.sentilo.io*
[13] *Government of Catalonia, toolsTIC, available online at http://sac.gencat.cat/sacgencat/AppJava/servei_fitxa.jsp?codi=14232*
[14] *Available online at http://www.cenatic.es/index.php?option=com_content&view=article&id=25669 and http://www.cenatic.es/publicaciones/divulgativas?download=21%3A10-razones-para-que-la-administracion-libere-software-extendido respectively*

• Greater software security and quality: by publishing the source code, it makes it possible for the developer community to constantly contribute to the security and quality of the software, correcting any errors detected and thus helping the application evolve more quickly.

• Development of the local ICT sector: as they have access to the code, SMEs in the sector can offer services to public administrations and companies in such a way that they can compete under better conditions with other more dominant operators in the sector.

• Value generation in the community: using free software allows public administrations and companies to share and reuse applications, enhancing collaboration between these entities and with the technology industry and developer community.[15]

**The resulting reuse makes it possible to enhance cost savings as part of the development, maintenance and evolution of the source code. However, primarily, it promotes the development of an economy based on knowledge and innovation, and contributes to the development of an information and communication technology ecosystem, improving the competition by encouraging cooperation between the public and private sector with the sole objective of improving public services, the quality of which are usually based on the mass use of information technologies.**

*Basque Parliament: Decree 159/2012, of 24 July, regulating the openness and reuse of IT platforms by the Public Administration in the Basque Country.*

## 4.3. Legal framework

It is clear that Spanish public administrations are competent in terms of acquiring and using free software, exchanging it among themselves and releasing the software they own to the community. In Spain, a number of general provisions tend to favour the use of free software in the public administration.

**a)** a) The most relevant was originally in Chapter III, Title IV of Law 11/2007, of 22 June, on electronic access of citizens to public services (LAECSP), entitled "Reuse of applications and technology transfer" (now **Art. 157 and 158 of Law 40/2015**, which establishes measures that, without directly promoting free software, facilitate (a) the reuse of IT resources between administrations, (b) the creation of software repositories for subsequent reuse (such as the Technology Transfer Centre repository of the Spanish Central Government) and (c) the release of applications owned by public administrations under free licences.

**b)** Furthermore, **the seventeenth additional provision of Law 57/2007**, of 28 December, establishing the Measures to Promote the Information Society, which states that public administrations may make **digital content** available to the public for which there are no restrictions on intellectual property rights, or for which said rights are in the public domain, subject to licences that facilitate the study, copy and redistribution under the same terms (i.e., with a degree of copyleft).

**c)** More importantly, **Royal Decree 4/2010**, of 8 January, regulating the National System of Interoperability in the scope of e- Government provides as follows:

• Article 16 establishes the licensing conditions applicable to reusable IT applications declared as open source, and in particular applications that can be redistributed to

[15] *Available online at http://www.cenatic.es/sobre-el-software-libre/ventajas-del-software-libre*

other users on the condition that the derivative work retains the previous conditions, in other words, with a degree of copyleft (weak or strong). Furthermore, in terms of the release of software, Article 16 recommends the use of the EUPL licence, without prejudice to other licenses that guarantee the aforementioned rights.

- Article 17 defines specific conditions applicable both to repositories of software for free reuse (in terms of their association with equivalent instruments at other public administrations) and the duty to consider solutions available to public administrations that may fully or partially satisfy the needs of new systems or services, improvements or updates to those already rolled out, and conditions in terms of the publication of the source code of IT applications in the aforementioned directories in order to promote sharing, reuse and collaboration in the pursuit of increased effectiveness and efficiency.

At a regional level, for example, there is the Order, of 21 February 2005, on the public availability of the IT programmes of the Regional Government of Andalusia and its and its autonomous organisms, and more recently, Decree 159/2012, of 24 July, regulating the openness and reuse of IT platforms by the public administration in the Basque Country[16]. Both promote the use and reuse of free software and the creation of repositories to facilitate the aforementioned actions.

The Italian Constitutional Court[17] has ruled that promoting free software-based solutions does not distort distort competition nor is it against the public-sector procurement law (in Italy), since stipulating the legal conditions for supplying software (the free software licence) and does not amount to technological, trademark or provider discrimination, rather is a legal condition in the specifications that all suppliers must fulfil.

The various laws to which Barcelona City Council is subject does not exclude nor require the use of free software within the Administration; however, some of the criteria established for acquiring software, such as the promotion of reuse or the need for interoperability, are achieved more effectively, consistently and in a more lasting way with free software licencing.

## 4.4. Public Procurement of Free Software

In terms of the conditions for acquiring technologies for the administrations' digital services as free software or free software-based applications, although no European country makes it mandatory to use free software, most ban discrimination against providers that submit bids involving free software, based on the principles of free competition and non-discrimination. However, they do require that supplied software complies with open and internationally recognised standards.

Other regulatory frameworks establish a preference for the use of free technologies. In 2014, for example, the Italian government promoted free solutions, establishing an order of priority in terms of the analysis of proposals: administrations must give preference to free solutions over proprietary software and cloud solutions.[18]

In Spain, software and software-related services supplied to the public administrations

*[16] Decree 159/2012, of 24 July, regulating the openness and reuse of IT platforms by the public administration in the Basque Country; and Order, of 25 September 2012, of the Department of the Interior, Justice and the Public Administration, approving the policy of openness and reuse of IT platforms by the public administration in the Basque Country.*
*[17] Italian Constitutional Court in 2010, with Decision no. 122 of March 22.*
*[18] Guidelines for art. 68 of the Digital Administration Code (Legislative decree no. 82/2005)*

are primarily regulated by the Royal Legislative Decree 3/2011, of 14 November, approving the revised text of the public-sector procurement law (recently updated). Beyond the standard public procurement procedures (specifications, bids, awards, enforcement and resolution, etc.), the following points are important in terms of free software:

**a)** This law considers the provision of "base" or standard software (belonging to third parties) as a supply, whilst tailor-made individual developments are considered services (Art. 9 and 10)

**b)** In the second case, the service provider (of the development) must transfer the rights of the modifications and customisations and other developments delivered under the contract to the public administration, unless established otherwise in the administrative specifications (Art. 301).

It is also worth noting that Article 17 of Royal Decree 4/2010, of 8 January, obliges administrations to consult the repositories and existing reusable solutions before procuring a new technology.

## 4.5. Licences for public administration software releases

Article 16 of the aforementioned Royal Decree 4/2010, of 8 January, establishes four conditions for Spanish public administrations to follow when releasing software:

**2.** In terms of the applications certified as open source, the administrations shall use licences that guarantee that the programmes, data or information shared:

**a)** Can be executed for any purpose.

**b)** Allow for the source code to be consulted.

**c)** Can be modified or improved.

**d)** Can be redistributed to other users either with or without changes, provided that the derivative work preserves the same four guarantees.

**3.** To this end, the European Union Public Licence shall apply, without prejudice to other licences that guarantee the same rights as those set out in sections 1 and 2.

This means that a public administration can use any current free software licence, provided that it contains an element of copyleft (condition 2(d) above) and it is "recommended" to use the EUPL licence. For releasing software by the European Commission or the EU and, by extension, other public administrations, a study was carried out in 2005 and it was established that no existing free licence was ideal, even though many may serve the purpose. Therefore, in 2007 (and updated in 2017), the *European Union Public Licence* (EUPL) was published, which is a licence with weak *copyleft*.

**The EUPL is a particularly interesting licence given its appendix on "compatible" or "interoperable licences". To avoid licence conflicts, the EUPL allows licensees to redistribute derivative works (and combinations or composites) under a compatible licence or under an incompatible licence indicated in the appendix (including the l'Eclipse PL, l'OSL 2.0 and 3.0, CeCILL, LGPLv2.1 and GPLv2 and now GPLv3 and AGPLv3 ). This express compatibility and the interoperability policy is applied to the final result of any integration (and not the original components that retain their own licence). Therefore, these terms of interoperability respect the original licence, whilst permitting interoperability with other, normally incompatible, copyleft licences.[20]**

[19] *See comments to Understanding the EUPL 1.2, available online at https://joinup.ec.europa.eu/news/understanding-eupl-v12*
[20] *See comments on EUPL "The European Union Public Licence (EUPL)", available online at http://www.ifosslr.org/ifosslr/article/view/91*

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# Interoperability, open standards and formats

Interoperability is the capacity of different information systems, possibly from different providers, to work together and share information without technical or legal boundaries. A more detailed definition of interoperability and its different scopes (organisational, semantic, technical and temporary) is available in the glossary.

Standards or norms are in place to facilitate interoperability between different products of companies in the market. When the norms are controlled by only part or some of them, this tends to lead to market domination. To prevent this phenomenon, the freedom of using and implementing standards in any form that is deemed appropriate by users and developers must be guaranteed.

Generally speaking, a standard is a rule or specification on specific engineering or technical criteria, methods, processes or practices, generally achieved via the consensus of the interested parties. Normally, rules are created by formal organisations like the ITU, ISO, IETF, W3C, OASIS, etc.

By adopting an open standard for a digital service, the administration and its end users are not limited to resorting to a specific provider and this decreases vendor lock-in; therefore, it is possible to increase the user's options and as a result, the market is more competitive in terms of the technologies and solutions that comply with the standard.

It has been argued that an open standard is more than a mere specification. An open standard is "open" on the basis of its underlying principles and the way in which it has been developed publicly and been approved and, therefore, is accessible. It is governed by a process of collaboration and consensus. An open standard is generally based on the principle that it is available so that each end user can gain access, read and run it without royalties or costs. It has been argued that a minimum or "reasonable" fee (for example, for a standardisation organisation to ensure compliance) could be enforced, which must be reasonable and non-discriminatory (RAND). However, to many this is unacceptable, as it inhibits, for example, deployments in free and open source software.

The Barcelona City Council believes that the use of open standards:

- Promotes interoperability and compatible integration between the multiple information systems and data series of the City Council, both internally and those interrelated with other external data and systems. Therefore, open standards are a prerequisite for technological neutrality.

- Establishes standard rules and reduces the differences between technical specifications, creating a level playing field, which decreases obstacles to the development and provision of competitive services locally, regionally and internationally, catalysing innovation whilst reducing costs.

• Facilitates greater synergy in terms of regional and international collaboration in the IT sector and in particular concerning the publication and exchange of data between different services and entities.

• Guarantees that information generated digitally at a specific moment in time will be readable and reusable in the future (regardless of the programmes used to generate or read this information). Thus, open, public specifications safeguard the preservation, longevity, integrity and reuse of information without restrictions.

• Reduces overlaps, allowing interdependent systems and entities to work together to complete or fulfil a process at a lower cost.

• Facilitates interaction between citizens and public administrations and private entities, as no specific software provider has to be used. A company or person using software based on open standards will never be obliged to purchase competing software to exercise their right to communicate with the public administration.

• Ensures the representation of more interests in the sector, thus ensuring continuous improvement, support, competition between providers and greater flexibility between technological options. This reduces the risk assumed by the City Council, in such a way that its users adopt the open standard specifications when the City Council's systems are integrated with those of its providers, citizens and other partners.

• Promotes the use of free and open source software, as the production process consists of defining publicly available specifications. The availability of its source code also promotes an open and democratic debate in terms of the specifications, making them more robust and interoperable.

The City Council believes that the minimum characteristics for a specification and its associated documentation for them to be considered open standards are as follows:

• The rule is adopted and shall be maintained by a non-profit organisation and its continuous development is structured around an open decision-making procedure available to all the interested parties (consensual protection of privacy in the e- communication sector or majority decision).

• The rule has been published and the standard specifications are available free of charge or for a nominal fee. It must available for copying, distribution and use by anyone, free of charge or for a nominal fee.

• Any intellectual or industrial property right surrounding the standard (for example, possible patents) is licensed to users free from royalties.

• There are no restrictions on the use and reuse of the standard.

Technical, semantic and organisational interoperability is, furthermore, regulated under Spanish legislation pursuant to Royal Decree 4/2010, of 8 January, regulating the National System of Interoperability in the scope of e-Government.

6

# Policy on technological sovereignty and guidelines for its implementation

## 6.1. Principles and guidelines

The policy on the technological sovereignty of the City Council is based on the principles and guidelines set out in the 2017-2020 Digital Barcelona Plan: Transition towards technological sovereignty, digital service standards and the Code of Technological Practices.

Generally speaking, these principles consist of:

- The use of open standards for all digital services.
- The prioritisation of free software and the reuse of IT resources.
- A new relationship model with providers and free software communities.
- A flexible intellectual property policy.

The main elements of this policy can be consulted below.

These principles and guidelines will be rolled out progressively via projects for digital transformation and migration to free software undertaken by the City Council and whose costs will be assumed by the IMI, which shall set the pace and make it possible to dedicate resources, create an infrastructure and acquire competencies to this end. This shall enable an iterative management of change implied by applying this policy within the organism via specific projects. Some projects and their extensions (for example, Decidim Barcelona, Sentilo, BIMA) already comply with these guidelines, whereas others will gradually become aligned with them as part of a more progressive implementation process.

## 6.2. Open standards and interoperability

The digital services of Barcelona City Council must be implemented using shared and open architectures for services, information and technology. Services will be built by implementing shared solutions in terms of system integration and their interfaces. The solutions will use open standards.

| *Interoperability* | **All of Barcelona City Council's digital services will support interoperability, based mainly on the use of open standards and formats.** |
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**a)** The interoperability requirements of each system, both externally having an impact on citizens, and in terms of the exchange of information in internal processes, shall be implemented based on open standards and formats, with the sole exception of systems that have already been deployed, for which there is no plan in place yet for their replacement.

**b)** Particular emphasis shall be placed on interoperability for the future: this ensures that the data retained by the City Council can be used (exploited, modified and expanded upon) regardless of the applications (and providers) that are used in the future.

**c)** When interoperability is required from systems that have already been rolled out and that use closed standards or formats, the option of amending these systems shall be considered by adapting them to open standards.

**d)** The interoperability needs of each system that must be developed or acquired shall be detailed in the tender specifications. Two different sets of circumstances may apply:

- In the event that a specific interoperability need is covered by an internationally accepted open standard, the tender specifications shall provide the name and version of this standard.

- When a specific interoperability need cannot be covered by an existing standard, the technical documents attached to the tender specifications shall contain full details of the information, protocols, interfaces, formats and processes to be used. These details shall make its implementation possible without having to resort to specific products or providers.

**e)** As an example of a specific case implementing these interoperability guidelines, please consult the City document management policy (at *http://ajuntament.barcelona.cat/arxiu- municipal/sites/default/files/InstruccioPoliticaGD_cat.pdf*)

| *The use of open standards* | **The City Council's digital services shall use open standards on a mandatory basis and, in particular, the contents of the catalogue of standards set out by the Technical Interoperability Norm (specified under Royal Decree 4/2010) or internationally accepted open standards that update, replace or complement these standards. When no approved open standard exists in the required format, a proposed format shall be submitted conforming with applicable regulations and the IMI's requirements for the open standards.** |
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**a)** An open standard must satisfy the following conditions:

- It is public and can be used free of charge or at a cost that poses no difficulty in terms of access.

- Its use and application are not dependent on the payment of an intellectual or industrial property right.

**b)** Open formats and standards shall be designed using the standard channel for exchanging information with citizens and no alternative or complementary method that uses closed options. Under no circumstances shall citizens be required to file an express request or perform additional activities to exercise their right to use open formats and standards.

**c)** Under no circumstances may the City Council force citizens to purchase or use systems belonging to specific suppliers to access public services. The foregoing would amount to ensuring that these providers have a monopoly, sanctioned by the public authority.

| *Identification of standards and formats* | **The IMI will maintain public lists of technical formats and standards in use, categorised as mandatory, priority or recommended.** |
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**a)** To facilitate the specification and procurement of systems and solutions, the IMI will maintain a list of technical standards that must be used.

**b)** The IMI would update the list in terms of both the evolution of national regulations and the evolution of international standards developed by the corresponding standardisation institutions.

**c)** Some standards may be mandatory for specific uses and recommended for others.

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| *Selection of standards* | **The selection of standards shall be subject to an open and transparent selection process based on users' needs, flexibility, the promotion of free competition and free collaboration and the implications on future interoperability. This process must be formally approved. Areas with their own legal framework shall be subject to the specific standards (for example, Geodata).** |

**a)** Applying a formal selection process is recommended, based on national regulations (Royal Decree 4/2010), the European Interoperability Framework (EIF) and the internationally recognised methods, such as the Common Assessment Method for Standards and Specifications (CAMSS, *https://webgate.ec.europa.eu/fpfis/mwikis/idabc-camss/index.php/Main_Page*).

**b)** The specific sectors shall maintain their own lists. For example, Geodata, for which a very strict framework is in place (*http://www.bcn.cat/geoportal/es/estandards.html*).

## 6.3. Free software and the reuse of resources

The City Council's policy in terms of free software seeks to harness, insofar as possible, the benefits of the free software development model, both in terms of the general technological sovereignty objective and on the grounds of economies and technological quality. Therefore, the main elements of this aspect of the City Council's technological sovereignty policy are as follows:

- To facilitate and promote the effective and efficient use of free software at the City Council.
- To reusing existing software and facilitate the reuse of the City Council's software by third parties, both amongst administrations and other individuals and institutions (under free licences).
- To migrate the City Council's systems to free solutions.
- To contribute and participate in free software communities, with a particular emphasis on local communities.
- To ensure respect for the rights of the City Council and third parties, in particular those of developers and members of the free software community.

When the City Council has access to the source code of its applications, in addition to the rights of reproduction, modification and distribution inherent to free licences, its independence from specific providers and the future maintenance and sustainability of municipal systems is guaranteed. Furthermore, a free software-based system is particularly useful when building services to be used by different municipal institutions and that can be shared with other administrations as well as with the wider user community. Public access to the source code is also a guarantee of transparency in terms of particularly important or sensitive systems, such as, for example, electronic voting or tax calculation systems.

Along these lines, the main elements of this policy, as defined in the Code of Technological Practices, can be seen below. We will discuss each element in more detail, offering explanations and guidance for their implementation.

## GENERAL GUIDELINES

The IMI's basic free software principles for complying with the city's technology sovereignty principles are as follows:

**a)**The public procurement of tools and systems shall prioritise free software.

**b)** All municipal technology projects that develop software internally or subject to contract, insofar as possible, shall ensure that said software is made available as free software.

**c)** With this objective in mind, internal development programs shall be based, by default, on open technologies that allow the final product to be freed.

**d)** Free software shall be used progressively by all municipal systems and applications as provided for by the City Council's free software migration plan.

These principles are structured around the following guidelines set out in the Code of Technological Practices:

| *Acquisition* | **The acquisition and public procurement of tools and systems shall give preference to the use of free software for all the technical architecture of the applications and services that are delivered, avoiding reliance on on systems that are not free. The deployment and use of closed systems shall only be allowed under exceptional circumstances, which shall be reviewed on a case by case basis, pursuant to the following criteria.** |
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**a)** Contracts for the purchase and development of digital services, including those concerning the adaptation of existing systems, must give preference to solutions and services based on free technologies.

**b)** The use of proprietary software shall only be accepted in cases in which:

- there is no open solution that fulfils the necessary requirements;
- the adaptation of an existing solution in order to fulfil the requirements is not viable, and
- the construction of a new solution, to be deployed under an open licence, is not viable. For the purposes of this paragraph and the preceding paragraph, whether a solution is not viable shall depend on technical reasons or the necessary resources, or because the increase in the period of time in which the solution will be made available prevents the success of the project.

**c)** The process for establishing whether the aforementioned exception is applicable is set out below in the section called "Preparation and preliminary designs".

**d)** In cases in which, pursuant to the aforementioned exceptional circumstances, it is not possible to propose a completely open overall solution, preference will be given to an architecture and a selection of components with minimal dependencies on closed source elements.

| *Freeing software* | **Both internal and external digital service projects for development of digital services must be developed from the beginning with a view to their freeing, following the best free software development practices, and based on open technologies that allow for the final product to be released. Documentation, design and other elements (sounds, fonts, etc.) shall also be published under open licences.** |
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**a)** a) The commitment to publishing software projects that are being developed, whether internally or outsourced, means that quality standards and common development practices used in free software projects must be taken in account from the beginning in order to safeguard success. A number of the elements to be included in the procurement specifications to safeguard these requirements are set out in the "Projects" sub-paragraph below.

**b)** Furthermore, to avoid obstacles when freeing software, the use of closed source subcomponents and reliance on closed development, administration and monitoring platforms and tools must be avoided, following the other recommendations in this document (see "Development" sub-paragraph in particular).

**c)** The IMI has established and shall maintain a free software release and migration plan, the roll out of which will facilitate the progressive implementation of best practices in the development and use of open technologies in the City Council's digital service projects.

**d)** The criteria to be followed to evaluate the release of a project include: that the product responds to a general need (and not a specific need of Barcelona City Council), that it compares favourably in some aspects with other existing free projects that resolve the same problem, that the City Council is able to do it legitimately in terms of third party rights, that the product can be run on free platforms and that it has sufficient technical quality and the documentation required to be used by third parties.

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| ***Reuse*** | **Software acquisition will provide incentives for reusing existing solutions. Development projects in which the City Council participates will attempt, on top of being released under free software licences, to offer technical and organisational facilities for their reuse by third parties. Where software owned by the City Council and its associated entities cannot be released under a free software licence (for technical or legal reasons), it will be made available to other administrations without the need for any valuable consideration or agreement, in accordance with applicable regulations.** |

**a)** Whenever possible, and following prior research, projects shall reuse or extend existing free tools in order to reduce maintenance costs and reinforce open ecosystems, before contemplating the creation of similar alternatives. In some cases, this will make it possible to reduce development costs and, in any case, promotes the strengthening of open ecosystems, the reduction of maintenance costs and the construction of better quality and more durable solutions.

**b)** Priority shall be given to reusing free technologies and components that are already being used by the City Council. As a result, costs can be reduced and consistency guaranteed in terms of user experience.

**c)** To facilitate the reuse of the code produced, it shall be published by the City Council using means including:

- · A project directory containing the City Council's main projects, with links to the code's repository, even when this is located on another platform, and to all the elements relating to projects' development and governance. This directory can be consulted online at *https://ajuntamentdebarcelona.github.io.*
- A centralised code repository (as described under "Development" sub-paragraph).

**d)** Bear in mind that the regulations in force (Law 40/2015, Art. 157-158) require systems owned by public administrations to be made available to other administrations that may request them, under the conditions set out therein.

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| ***Sharing or pooling projects*** | **When appropriate, the possibility of collaborating with other public administrations and entities in the development of technological projects of interest shall be considered, with a view to sharing costs and promoting interoperability.** |

**a)** Pooling projects close cooperation between municipal governments and other administrations or entities in order to jointly develop tools for everyone's benefit. Participants share needs and specifications, costs, economic resources and development teams, in addition to the code that is developed..[21]

**b)** To encourage the pooling of projects, the Localret network of towns and cities may be used, in addition to other national or international networks.

**c)** To share the required information with other administrations and entities to promote pooling, the City Council shall periodically publish software acquisition plans (road maps) that set out the forecasts for software acquisition or development for the following months or years.

[21] *See, for example, the CommunesPlone project: https://joinup.ec.europa.eu/community/osor/case/networks-effects-plone-belgium-and-beyond*

## PROJECTS

The use of free software and the corresponding open technology and development methods has specific implications in terms of the preparation and management of digital service projects.

Preliminary projects (for example, initial designs of a system to be built) are a key piece in the IMI's public procurement and acquisition process. Their reports must always include options based on open technologies.

These principles are structured around the following three guidelines:

| ***Preparation and preliminary projects*** | **During the contract preparation phase, it must be demonstrated that exhaustive research has been undertaken in terms of possible existing and reusable solutions, both nationally and in international public repositories.** |
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**a)** The preparation phase shall study the market and establish the technological specifications and, as applicable, the technologies recommended for future municipal development or implementation projects. This preparatory work often is carried out through a preliminary project.
**b)** Alternatives must be sought in at least the following free software repositories: GitHub, SourceForge, JoinUp and the Technology Transfer Centre, pursuant to the provisions of Royal Decree 4/2010 and Law 40/2015.
**c)** IIn the event that solutions based on proprietary software are proposed, it must be demonstrated that they fulfil the exceptional conditions set out under "Acquisition" subparagraph above, and that therefore the use of the proprietary software is the only viable option. Therefore, the preliminary design must include a specific report that:

- Demonstrates the quality and rigour of the research undertaken on free software-based solutions. The preliminary project contract itself may mention any of the alternatives that must be studied if the IMI is aware of them.
- Demonstrates how the option of building new solutions has been assessed, including an estimate of their cost.
- Includes a simulation of the requirements that call for the use of proprietary software and the requirements or functions that would have to be rejected in order to build an alternative solution without using proprietary software.
- Specify the possible impact on the interoperability of the system with other systems and platforms and the possible vendor lock-in that may occur as a result. Actions to mitigate these impacts must also be proposed.
- In the event that a proposed solution using proprietary software imposes any type of restriction on the construction or evolution of other information systems or technical platforms using free solutions, this report justifying the use of proprietary software must include all possible repercussions.

**d)** Work will be carried out to establish a committee of free technology experts who can advise on the design and assessment of the preliminary projects and also offer assistance, if proprietary technologies are proposed, for determining the admissibility of the alleged exceptional circumstances.
**e)** Preliminary projects must assess the maturity, maintenance conditions and expected sustainability of the proposed software components[22]. In future, the IMI may make teams and resources available to projects in order to provide assistance with this undertaking.
**f)** An important function of the preparatory phase, when free projects are preselected for expansion or adaptation, is researching the legal and technical requirements to participate in these projects. To this end, contacts can be made with the maintainers and the legal owners of these projects, in addition to noteworthy developers thereof. The result of this phase shall include a description of the obligations resulting from these requirements, to be included in the procurement contract specifications.
**g)** In terms of projects that are subject to harmonised regime, it must be demonstrated that the search for reusable solutions to be deployed has been undertaken at EU level.

[22] *For example, following the Open Preservation Foundation model, available online at http://openpreservation.org/technology/principles/software-maturity*

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| ***Technical and functional specifications*** | **The proposed projects must not include any specification that prevents the proposal of solutions based on open technologies nor name specific products or providers, unless on the grounds of compatibility with existing technologies, subject to the criteria set out in this Technological sovereignty guide. The architecture, interoperability requirements and the right and capacity to modify and reuse the software of systems and services shall be considered technical characteristics and requirements.** |

**a)** Development based on free software will not be achieved by simply mentioning this term, but by means of clarity in functional, technical and legal requirements that enables and even promotes the use of open technologies.

**b)** Technical requirements that require specific solutions shall be avoided, particularly where they may not even be necessary following a more detailed analysis of the underlying requirements.

**c)** Whenever possible, tender specifications shall include detailed functional and technical specifications of the system to be developed or acquired. This does not mean that during the development phase, applying agile and iterative methodologies, these specifications cannot be refined, improved or adapted when mutually agreed with the internal customer.

**d)** Generally speaking, tender specifications for new solutions shall not name a product (and much less a provider) of specific software and, in all cases, must include the phrase "or equivalent".

**e)** An exception shall only be made (in other words, a specification of criteria that prevent free technologies from being offered or a reference to specific privative products) when it is required on the grounds of compatibility with existing technologies, the replacement of which requires more long-term planning (as set out in "Preparation and preliminary designs").

**f)** Notwithstanding the foregoing, compatibility with proprietary products procured in previous tenders shall not be considered a generally acceptable exception, given that this would promote reliance on a single provider and make it difficult to take impartial procurement decisions based exclusively on the City Council's needs.

**g)** In contrast, there is no restriction on mentioning specific freely licenced products in the tender specifications, as this would not create any reliance on any specific provider.

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| ***Cost calculations*** | **All decisions on the acquisition of technologies shall consider the total cost of the system during its long-term service life (TCO, Total Cost of Ownership) including hidden costs (for example, exit costs when replacing technology in the future when formats or interfaces are not standard) in addition to the net benefits for society.** |

**a)** The economic calculations must be specific to the project's needs; however, the spill over effects (secondary costs and benefits) must also be considered, for example, through the reuse of technology by public administrations and the acquisition of internal skills.

**b)** Hidden costs must be taken into consideration (for example, exit costs when implementing proprietary or non-standard solutions) in addition to encouraging the procurement of products that satisfy open standards and include an adequate level of interoperability moving forwards.

**c)** Decisions must also take into consideration how to maximise the net economic and social benefits for the local economy and society in general, in the medium to long term.

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| ***Procurement of projects and services*** | **Contracts for new projects or the expansion of existing projects shall contain standard clauses based on these principles, including for preliminary projects in which technologies are preselected, in addition to framework agreements and contracts in separate batches. These clauses shall require the use of solutions based on free technologies, with the exception of the special circumstances provided for under "Acquisition".** |

**a)** The IMI shall produce these standard clauses for the Technology Procurement Guide and include them in the form of an appendix.

**b)** The clauses shall not include conditions that contradict the principles indicated herein, for example, a requirement to preserve the confidentiality of code published in a public repository (whether as free and open software or not).

| *Best development practices* | **The development of digital infrastructures and services shall comply with best practices applied in free and open source software development methods, using by default the agile methods applied in the IMI.** |
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**a)** Source code shall be managed effectively using modern version control systems that enable contributions to be traced and external contributions to be managed simply, and support different branches (main branch, maintenance branch, specific branches for the development of functionalities) and project forking, as applicable.

**b)** The City Council shall maintain its own organisational space on an online software project management and publication platform. This space shall contain a repository for each software project in which it has participated (whether directly or via contracts), even if the development is made on another platform or using another repository managed by another entity (in this case, the City Council's space shall mirror the main repository).

**c)** Projects undertaken by the City Council shall feature a public issue tracking system in which anybody can report bugs and follow their progress. The system will also allow contributions to be made and their integration to be tracked, in addition to enabling improvements or adaptations to be suggested.

**d)** All code and comments must be in English. A troubleshooting forum will be available in English. Optionally, some projects may choose to establish platforms for participation in project development in which Spanish and Catalan are the preferred languages.

**e)** Projects shall also have a continuous integration system that makes it possible to run batches of automated tests and that publishes the results.

| *Code and document maintenance* | **During the contract term, IT development service providers shall collaborate with the IMI to ensure that the code is available in adequate version control systems. Furthermore, all systems and services must be correctly documented for administrators, users and developers, including instructions required for installation, demploy-ment and configuration of the service in free and open environments.** |
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**a)** Tender specifications shall establish the period and form in which the contractor is obliged to maintain and support the code in the operating conditions.

**b)** Contracts that include the operation and administration of a service shall establish that the code to be used must have been published previously in the project's main repository in a branch dedicated to this end (which may be the main branch). The repository of free or freed projects shall be public.

**c)** Bug reports and their resolution shall also be carried out in a visible and transparent manner, using the means set out under "Development".

**d)** All projects will have a specific versions policy defined in its repository or via a link (for example, SemVer).

**e)** The public repository must include sufficient documentation to deploy or maintain the code (for example, a Readme file with a description of the project, the requirements for using the software, a reference to the installation instructions, the licence that is used, etc.).

**f)** Tender specifications shall define the user documentation (including for managing the service) that must be provided by the contractor and its technical characteristics, languages, etc. This documentation will also be published and covered by a licence, which will be defined in the specifications, using CC0 or CC-BY-SA 3.0 by default.

**g)** All the files contained in the repository referring to documentation, including user documentation if it is featured in the code repository, shall be in English and be formatted in plain text or in a lightweight markup language, such as ReStructuredText.

## A NEW RELATIONSHIP MODEL WITH PROVIDERS AND THE COMMUNITY

The city's model for technological sovereignty seeks to prevent dependency on a single provider, which is also a key factor in increasing the capacity for innovation in public services. Wherever possible, the procurement of digital services must increase the diversity of providers.

The most innovative and effective free and open source software projects require a community of stakeholders that is effectively managed, participating in and contributing towards the evolution and sustainability of the software. The IMI will follow community principles of sustainability, openness, transparency and participation.

Factors to be taken into account include the governance of the community and the technical management of these projects, including the approval of the code for its inclusion in the project and the definition of requirements and the corresponding roadmap. The diversity of contributions shall be encouraged, although for critical projects, the IMI shall retain effective control over technical developments financed using public funds.

These principles are structured around the following guidelines:

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| ***Collaboration with free software communities and other institutions.*** | **Proposed projects shall study options for collaboration with technological and free software communities, in particular local communities. Collaboration with other interested entities and institutions shall be encouraged to promote social innovation and local technological products and skills.** |

**a)** The tender specifications (projects and preliminary projects) may establish the existence and possibility of collaboration with a community of developers and users for the technologies to be selected as an assessment criterion.

**b)** b) As part of the project's implementation, cooperation with developer and user communities shall be promoted, in particular if they are local communities, via processes aimed at promoting the development and use of software, including seminars, conferences, technical meetings (hackfests, etc.) in addition to processes for community management and release management (see "External contributions").

**c)** In addition to the standard channels of cooperation with open development communities (addressed under "Development"), for certain strategic projects, specific mechanisms aimed at local developer and user communities may also be mandatory. These may include online collaboration tools (forums, wikis, mailing lists) or presence based events (hackfests), and the main language may be either Spanish or Catalan.

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| **Sustainability and governance** | **Projects that produce complete free and open systems or tools as a result of a development service promoted and financed by the City Council shall include a project sustainability and governance model. This model will include, in addition to other aspects, an idea of the definition of the community, support tools, communication and marketing activities, processes for accepting external contributions, intellectual property management and the sustainability of the tool beyond the City Council's project.** |

**a)** The definition of a project's "community" may include: other City Councils and public administrations, specialist sectors such as Geodata or libraries, organisations or institutions related to the project's technologies.

**b)** The governance structure of the projects includes the definition of:

- A policy on dependencies: who and how admissible dependences are decided upon.
- A contributions policy: who and how contributions included in the products are decided upon.
- The relationships and management bodies shared with other entities such as companies or other public administrations.
- A communication and marketing policy.

**c)** For large-scale projects, adopting (or writing) a code of conduct (in English) is recommended, with a link from the project's website and in the Readme file in the repository. This document serves to establish the rules of participation in the project's online communication channels, in addition to the rules of contact for possible in-person events.

| *External contributions* | **Projects led or freed by the City Council shall encourage contributions from external stakeholders. Specific rules shall be established, adapted to each case, for the management of rights over these contributions, in order to ensure compliance with third party rights and applicable regulations.** |
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**a)** The recommendations in this section seek to achieve the following objectives for projects freed by the City Council:

- To integrate as much as possible valuable, high-quality contributions insofar as possible (in terms of both code and bug fixes, etc. and documentation) coming from parties other than the City Council's activities and those of its contractors.

- To ensure that all contributions have sufficient technical quality.

- To ensure the legal integrity of the contributions (ensuring that third party intellectual property is not included by mistake or incorrectly).

- To prioritise contributions that favour achieving Barcelona City Council's objectives or the objectives of other institutions sponsoring the project and, in any case, accept only those that do not hinder this process.

**b)** For all projects that are freed, documents required to facilitate the development and deployment of the software by third parties must be included in project's repository (in line with free project practices: for example, Readme, Install, Contributing, Roadmap files etc.).

**c)** Contributions management shall include a protocol for contributions and management of the corresponding rights, in particular to ensure that third party intellectual property is not included by mistake or incorrectly.

**d)** To ensure that the requirements for contributing code are strictly technical, bureaucratic barriers to contributions must be minimised. With this objective in mind, instructions shall be provided on project programming styles and standards and how to make contributions from a legal perspective (as explained under "Intellectual property" and "Legal management" below).

**e)** To ensure that contributions are traceable and that fragments of code that may pose a legal risk can be eliminated, as the case may be, all contributions that are ultimately included in the product must be signed by a party authorised by project maintainers in accordance with the protocol for a Developers Certificate of Origin (DCO), as is the case for the Linux kernel and many other free projects.

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| ***Upstreaming and forwards compatibility*** | **Projects that improve or transform an existing free software product, whether undertaken by City Council or provider staff shall, insofar as possible, contribute these improvements and upstream any corrections to the original project. Furthermore, projects shall guarantee, to the extent possible, forwards compatibility in such a manner that the software adapted for the Barcelona City Council minimises the number of potential update and maintenance problems.** |

**a)** Upstreaming means making code contributions (developed by and on behalf of the City Council) to existing free projects, so that this code can be included in the trunk software and thus form part of the free project.

**b)** The extra (short-term) costs corresponding to making these contributions to the original project (upstreaming) are justified by the fact that, that once changes have been made, the new functionalities or improvements are maintained by the entire community working on the project. Furthermore, this also ensures the quality of changes that are introduced and compatibility with future changes made by third parties.

**c)** The commitment to upstreaming extensions or modifications made to free software projects is made concrete through the following conditions for implementing each relevant project:

- Contractors shall comply with the quality criteria of the original project, including regarding coding standards.
- Contractors will be responsible for making the modifications implemented available to the community following the channels and protocols described thereby.
- Clauses on intellectual property and licensing will be established based on the expectations of the original project.
- The developers contracted or subcontracted by the City Council must sign a contributor license agreement (CLA) or DCO with the the project managers, if so required.

**d)** For free software projects that have a written code of conduct, it is recommended to specify clauses in the technical specifications that make it possible to penalise contractors who fail to comply.

## FLEXIBLE INTELLECTUAL PROPERTY POLICY

With respect to intellectual property rights, the City Council contemplates both the traditional figure of assignment of rights in new developments to the City Council as well as the option of allowing providers to retain ownership of rights in the results, provided that they release the software under a free and open source licence. This promotes local industry and the reuse of resources.

As a general rule, the accumulation of intellectual property at the IMI shall be avoided and, where applicable, software and acquired solutions should be freed or their reuse permitted. Therefore, when appropriate, intellectual property rights in developments shall not be transferred in full to the IMI by providers or other contributors, so that these developments can be recycled for other projects, provided that the IMI can reuse, combine or modify the software generated and, if applicable, release it under an open source license.

To facilitate and speed up the deployment and reuse of applications, each technological project managed by the IMI shall establish a clear legal framework for managing intellectual and industrial property rights, the use of components under different licences and contributions to the project, clearly identifying the owner of the rights in the software and the scope and characteristics of any license or assignment of rights.

External contributions outside the scope of the supply or service contract will require a formal process to support rights management, whether under an agreement that assigns rights to the City Council, or in the form of the project licence or a contributor licence agreement (CLA) or a Developers Certificate of Origin (DCO), to ensure that third party intellectual property is not included by mistake.

Projects must use a centralised tool of the IMI to manage both the licences on generated software and those pertaining to components used in the development.

These principles are structured around the following guidelines:

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| ***Intellectual property rights in the software*** | **The City Council's projects will establish a legal framework for clearly defining and managing the intellectual property rights in software developments. Depending on the circumstances, the agreements will establish the selected ownership model, including the options of transferring rights to the City Council or the IMI, leaving the rights to the provider or transferring them to entities that manage the relevant code of the project, provided that they are made available under free and open source licence for released projects.** |

**a)** Each project will define which individuals and organisations will retain ownership of the intellectual property rights in the software.

**b)** As a general rule, the accumulation of intellectual property at the IMI shall be avoided. When intellectual property rights in the software developments are not transferred to the IMI, providers may retain them and have the capacity to recycle developments for other projects; however, in any case, the City Council must have the right to use, combine and modify the software generated and allow it to be freed or otherwise reused.

**c)** In some cases, the IMI will want to retain effective control of technical developments financed using public funds. External contributions outside the scope of supply will require a contributor licence agreement (CLA[23]) to be signed. Notwithstanding the foregoing, there are other options for correctly managing contributions (establishing a DCO[24] or contributions being made under the project licence or a more permissive licence).

**d)** Regardless of the intellectual property policy, which may differ from one project to the next, the authorship of all contributors shall be reflected in an Authors file in the public repository.

[23] *See, for example, http://harmonyagreements.org/*
[24] *DCO: Developers Certificate of Origin. For example: https://developercertificate.org/*

| | |
|---|---|
| ***Legal management of software development projects*** | **Projects must establish processes and documentation for managing the legal aspects associated with intellectual property and software licences (in particular, for contributions and licences of components used as part of the development and other software dependencies, ensuring that all licences involved are compatible); to this end, best practices and standard tools or tools commonly used in the sector shall be employed to ensure the traceability and integrity of the code.** |

**a)** Correct legal management will facilitate compliance with regulations and the rights of third parties during the project and thereafter.

**b)** The specifications must ensure that the legal integrity of contributions made to the code repository is safeguarded, in other words, that at no time should code be included which is not the author's or for which permission has not been granted for its use under the conditions required by the licence. A policy for signed commits should be used, for the assignment of rights or DCO.

**c)** Contractors shall also be obliged to establish a full list of third-party components included in the project, notifying the IMI each time that a new software dependency is introduced in the project and analysing whether the new package on which the software depends has a free licence that is compatible with the rest of the project.

**d)** The code repository must feature a Licence file with the full text of the licence to be used for the project. If the licence so requires, each code file shall specify the licence under which it is distributed and the individuals or entities that retain intellectual property rights (copyright notice).

**e)** The use of standards and best practices such as SPDX and OpenChain will be encouraged to ensure greater transparency between suppliers and the City Council and compliance with the best legal practices in the sector.

**f)** The IMI will appoint an individual responsible for managing the legal aspects of its projects with a view to ensuring compliance with legal obligations associated with the free licences and other legal topics (intellectual property, trademarks, governance of communities).

| *Licence for freeing software* | **Software produced within the framework of the City Council's digital service projects, including the software resulting from service agreements, shall be made public under a free or open source software licence that complies with applicable regulations. The City Council shall establish the criteria and requirements for establishing the type of licence to use in each project.** |
|---|---|

**a)** The licence chosen must comply with the requirements of Royal Decree 4/2010.

**b)** The licence shall depend on the type of software development and how it has been created, using criteria including the degree of license permissiveness or reciprocity (copyleft), internal and external compatibility with other projects, licenses for software as a service platforms, etc.

**c)** Insofar as possible, the City Council shall avoid the proliferation of licences, in such a way that a range of recommended and compatible licences will be created for the City Council's technology infrastructure.

**d)** When expanding or adapting existing free projects, the same licence shall be used.

**e)** In other cases, the free licence to cover the project's entire code may be established in advance as an operating condition of the contract (binding to the contractor).

**f)** Tenders for new software development contracts may require a specific free software licence, or bidders may be given room to propose the licence that they wish to use, in recognition of the legitimate commercial and licensing policies that different suppliers may have (provided that they are free software licences). In any case, the criteria for selecting or evaluating licences as part of tenders shall bear in mind that the selected licence:

- Must be on the Open Source Initiative list of licences. The creation of ad-hoc licences or the use of public domain licences is not recommended whatsoever. Nor is it recommended to use very rare or unknown licences.

- The City Council must be protected in terms of the warranties and responsibilities relating to versions of the software that may be redistributed.

- Licences that promote the integration and interaction of the project with its technological ecosystem (for example, for a Python component, choosing a licence common to the Python community) are recommended.

- If all other conditions are the same, using a licence with copyleft is recommended (including "ASP/network copyleft" for distributed applications), as this is considered appropriate by Spanish law and serves to prevent a product developed with public funds from eventually becoming private.

**g)** The IMI will have a team dedicated to assessing the legal aspects and licences of projects and establishing the obligations of each licence used.

| *Trademarks* | **If a trademark is registered to designate a software project freed by the City Council, the Council shall establish a public use policy that allows members of the community of users and developers to use it within the framework of the community's activities.** |
|---|---|

**a)** For projects to be freed, using a name that is identical or similar to existing free projects must be avoided as well as any already registered trademarks for products and services in the information technology sector.

**b)** Trademarks serve to differentiate projects and prevent imitations or similar projects (including forks), that could exploit the reputation and efforts of the original project sponsored by or belonging to the City Council.

**c)** The trademark use policy shal allow the community and third parties adopting or implementing the software to use the project trademark whilst restricting its commercial use by third parties in breach of the rules defined by the community and the City Council.

# Appendix 1. Glossary

**This glossary includes a list of the key concepts that are used in this Code of Technological Practices. The concepts have been defined illustratively but not exhaustively so that anyone with access to the content, regardless of their level of technical knowledge, can use it and understand it and thereby share the meaning of these concepts**

## PRELIMINARY CONSULTATIONS WITH THE MARKET (PRELIMINARY PROJECTS)

A series of activities that seek to maintain constant dialogue between the contracting authorities and the market, prior to the launch of the procurement proceedings. The aim of this undertaking is to facilitate a more in-depth understanding of the needs of providers, studying and assessing the most comprehensive number of solutions on the market possible, and appropriately defining the characteristics of the contract.

These processes are highly recommended when the services up for tender are particularly complex (and therefore, the solution is also complex) or if they require innovative solutions.

## VENDOR LOCK-IN

In Information and Communication Technologies, this term is used to refer to circumstances in which the provider or a given product or technological service retains power over the purchaser, given that once the product is implemented or the service provided, the customer is unable to change product or provider due to the cost in terms of time and money that the change in process involves, or the lack of viable alternatives.

These circumstances may be attributable to different factors, such as:

**a)** The use of proprietary software that can only be accessed by the provider and that, therefore, can only be developed or maintained with guarantees from said party.

**b)** Lack of technical skills on the part of the customer or organisation, meaning the service cannot be taken up using internal resources once it has been developed.

## OPEN STANDARD

An open standard must satisfy the following conditions:

**a)** It is public and it can be used free of charge or at a cost that poses no difficulty in terms of access.

**b)** Its use and application are not subject to a payment for an intellectual or industrial property right.

(Art. 11 Royal Decree 4/2010)
In terms of standards that do not feature in the legally established catalogue as "open", the IMI adopts the following definition:

- Open and Free to Use. Any essential intellectual and industrial property rights to implement the standard (including "essential" patents) must be made available to everybody irrevocably and free of charge (no royalties can be applied). Reversible agreements on royalties or variable price formulas are not acceptable, as they can create problems for the free and open source software and innovation and, in principle, they will not be used unless justified in accordance with the Law. Clear authorisation must have been granted to use any intellectual or industrial property rights in projects involving free or open source software. Furthermore, the rights set out in the standard must allow for its reproduction and redistribution with no limitations and with no need to sign an agreement.

- Non-discrimination. The standard shall not feature any technical or legal clauses that limit its use to groups or a specific purpose.

- Comprehensive information. The information is sufficiently comprehensive for multiple deployments of the standard, in a framework of commercial competition, in such a manner that they are interoperable. The components, interfaces, extensions and protocols must comply with the same conditions of the standard to ensure that in practice, no applications or solutions that deploy restricted versions of the standard monopolise the market.

- Open collaboration. The standard is developed as part of a transparent, consensual process that is open to the involvement of all stakeholders. Preferably, a non-profit organisation will assume responsibility for governance of the standard. Under no circumstances are standards dominated by a single group or organisation admitted. Preference is given to standards that are actively maintained, on an ongoing basis.

## INTEROPERABILITY

The ability of information systems and, therefore, the procedures supported by these systems, to mutually share information and facilitate the exchange of information and knowledge (Royal Decree 4/2010).

- Organisational interoperability: The aspect of interoperability that encompasses the ability of institutions and the process that they use to perform their activities to collaborate with a view to fulfilling mutually agreed objectives regarding the services offered.

- Semantic interoperability: The aspect of interoperability that encompasses the fact that information exchanged may be interpreted automatically and reused by applications that are not involved in their creation.

- Technical interoperability: The aspect of interoperability that encompasses the connection between information technology systems and services, including aspects such as interfaces, interconnection, integration of data and services, the presentation of information, accessibility and security, or other similar aspects.

- Interoperability over time: The aspect of interoperability that encompasses the interaction between elements that correspond to different technological waves; it is particularly important in the conservation on information on digital supports.

Technical, semantic and organisational interoperability are, furthermore, highly regulated under Spanish legislation pursuant to Royal Decree 4/2010, of 8 January, regulating the National Interoperability Framework in the field of Electronic Administration.

## OPEN SOURCE SOFTWARE

This term encompasses all public software that is distributed under an open licence.

The Open Source Initiative (OSI) is a widely recognised non-profit organisation of international prestige that works on establishing standards, training and the promotion of advantages and relevance of using open source.

According to the OSI, for software to be considered open software, it must be published under a licence that fulfils the following conditions:

**1.** Free redistribution: the software must be made available freely.

**2.** Source code: must be included, public or freely available.

**3.** Allows for modifications or derivative works: the redistribution of modifications must be permitted.

**4.** Integrity of the author's source code: licences may require that modifications are only redistributed in patches, leaving the original source code unchanged.

**5.** No discrimination against persons or groups: nobody can be excluded.

**6.** No discrimination against fields of endeavour: commercial users cannot be excluded.

**7.** Licence distribution: the same rights must apply to everybody receiving the program and the licence must remain untouched upon distribution or modification of the software.

**8.** The licence must not be specific to a product: the programme must not be licensed solely as part of a larger distribution.

**9.** The licence must not restrict any other software: the licence cannot stipulate that any other software distributed with the open software must also be open source.

**10.** The licence must be technology- neutral: it must not be required that the acceptance of the licence is reliant on the click of a mouse or another specific software support.

Therefore, a distinction must be made between products like free software or open source software that offer users the freedom to use and improve it, providing access to the source code and allowing it to be modified and freely distributed, and products that simply provide access to the source code but do not allow for modification or distribution.

Therefore, not all products for which their source code is available are necessarily open source or free product, as despite being transparent, they cannot be modified or distributed. Accordingly, it must be noted that for all legal and contractual purposes, open source is the same as free software. The policy, philosophy and ethics of both movements are different. Thus, in this guide, we use the terms "open source" and "free software" interchangeably.

## FREE SOFTWARE

Free software is software that can be used, studied and modified in an unrestricted manner and that may be copied and redistributed whether in a modified version or without modifications or restrictions, or subject to minimum restrictions to ensure that future recipients also retain these rights. Free software must not be mistaken for freeware. Generally speaking, a programme is considered free when it includes the four freedoms defined by the Free Software Foundation:

- The freedom to run the program as you wish, for any purpose (freedom 0).

- The freedom to study how the program works, and change it so it does your computing as you wish (freedom 1). Access to the source code is a requirement.

- The freedom to redistribute copies (freedom 2).

- The freedom to improve the program and redistribute it with the improvements made giving the whole community a chance to benefit (freedom 3). As with freedom 1, access to the source code is a requirement.

Free software must not be mistaken for freeware.

In this guide, we use the term free software and open source interchangeably.

## PROPRIETARY SOFTWARE

The term "proprietary software" corresponds to software that is distributed under a licence that is not free or open and that cannot be modified or adapted and redistributed by another user. Generally speaking, the source code is not available to third parties.

## INDUSTRIAL PROPERTY[25]

A set of exclusive rights held by an individual or entity over an invention or other immaterial

creation produced thereby (patents, trademarks or industrial designs) that can be used by third parties.

Industrial property grants exclusive rights that allow the holder to decide who can use them and how they can be used.

These rights are granted as part of a procedure undertaken by the competent authority (in Spain, the Spanish Patent and Trademark Office) and they are protected throughout the entire territory overlooked by the organism.

## INTELLECTUAL PROPERTY[26]

Intellectual property corresponds to a series of personal and property rights that are retained by the authors and other holders over the works (in the case of ICTs, developments and services) that they created.

## TECHNOLOGICAL SOVEREIGNTY

Technological sovereignty involves a high decision-making and self-management capacity on the part of an organisation or entity (in this case, the City Council) over the technology used within a given scope, in addition to the ability to maintain and develop it in line with its principles and needs.

This approach contrasts the traditional dynamics of the supply of ICT services, which for the large part has been structured around the use of private licensed software.

These dynamics have always favoured a reliance on technology providers.

*[25] Patents and models. Law 24/2015, of 24 July, on Patents. Distinctive signs. Law 17/2001, of 7 December, on Trademarks. Industrial designs Law 20/2003, of 7 July, on the Legal protection of industrial designs. Semiconductor Topographies. Law 11/1988, of 3 May, on the Legal Protection of Topographies of Semiconductor Products.*

*[25] According to the provisions of Royal Legislative Decree 1/1996, of 12 April, approving the revised text of the Intellectual Property Law.*

# Appendix 2. Furtherinformation; references


**FREE SOFTWARE FOUNDATION:**
*Free Software Definition*, available online at *https://www.gnu.org/philosophy/free-sw.es.html*, and *What is copyleft*, available online at *https://www.gnu.org/licenses/copyleft.es.html*

**OPEN SOURCE INITIATIVE:**
*Open Source Definition*, available online at *https://opensource.org/osd*, and Frequently Asked Questions, available online at *https://opensource.org/faq*

**UNIÓN EUROPEA:**
*Communication COM(2013) 455 final: Against lock-in: building open ICT systems by making better use of standards in public procurement*. Available online at *http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=2327*

*SWD(2013) 224 final. Guide for the procurement of standards-based ICT — Elements of Good Practice*. Available online at *http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=2326*

*The Sharing and Reuse Framework for IT Solutions* (2016). Available online at *https://joinup.ec.europa.eu/sites/default/files/sharing_and_reuse_of_it_solutions_framework_final.pdf*

*Governance Models for Sharing and Re-use for Common IT Solutions* (2013). Available online at *https://joinup.ec.europa.eu/sites/default/files/b6/cc/cd/Governance%20Models%20for%20Sharing%20and%20Re-use.pdf*

OSOR: *Guideline on public procurement of Open Source Software* (2010). Available online at *https://joinup.ec.europa.eu/sites/default/files/24/ac/83/OSS-procurement-guideline%20-final.pdf*

OSOR: *Guidelines for Public Administrations on Partnering with Free Software Developers*. Available online at *http://www.osor.eu/idabc-studiesec.europa.eu/idabc/servlets/Docbe59.pdf?id=28128*

*Open Source Software Strategy*. Available online at *https://ec.europa.eu/info/european-commissions-open-source-strategy_en#softwarestrategy*

*Political support and pioneers pivotal for open source*. Available online at *https://joinup.ec.europa.eu/community/osor/news/political-support-and-pioneers-pivotal-open-source,* quoting Loon y Toshkov, *Adopting open source software in public administration: The importance of boundary spanners and political commitment*, available online at *https://doi.org/10.1016/j.giq.2015.01.004*

*Public administration should prefer open source*. Available online at *https://joinup.ec.europa.eu/community/osor/news/%E2%80%98public-administration-should-prefer-open-source%E2%80%99*, quoting al Proofs Dietmar Harhoff, director of the Max Planck Institute for Innovation and Competition, available online at *https://www.youtube.com/watch?list=PLpH-qfsEDn8h6GP5K5NVM1D1_cJRDA6S-z&v=b5akW_VS57Q*

## CENATIC:

*Software de fuentes abiertas para el desarrollo de la Administración Pública Española*. Guide on the use of free software in Spain's public administrations. Available online at *http://observatorio.cenatic.es/index.php?option=com_content&view=article&id=39:software-de-fuentes-abiertas-para-el-desarrollo-de-la-administracion-publica-espanola-una-vision-global-2008&catid=5:administraciones-publicas&Itemid=21*

*Diez razones para el uso de software de fuentes abiertas en la educación*. Available online at *http://www.cenatic.es/index.php?option=com_content&view=article&id=25669*

*Diez razones para que la administración libere software.* Available online at *http://www.cenatic.es/publicaciones/divulgativas?download=21%3A10-razones-para-que-la-administracion-libere-software-extendido*

## FOSSPROJECT/PS-OSS:

Studies and guidelines for collaboration between public administrations and free software developers. *Free/Libre and Open Source Software: Survey and Study, FINAL REPORT*. Available online at *https://joinup.ec.europa.eu/sites/default/files/doc/PS-OSS%20Final%20report.pdf*

General studies on free software for the public administration in the EU. Available online at *http://www.flossproject.org/*

## SPAIN MAP:

*Propuesta de recomendaciones a la Administración General del Estado sobre utilización del software libre y de fuentes abiertas*, general study on the use of free software by the Spanish Ministry of Public Administrations. Available online at *http://www.csi.map.es/csi/pg5s44.htm*

## GOVERNMENT OF THE UNITED KINGDOM:

*Technology Code of Practice*. Available online at *https://www.gov.uk/government/publications/technology-code-of-practice/technology-code-of-practice*

*Service Manual*. Available online at *https://www.gov.uk/service-manual*

## NEW ZEALAND:

*NZGoal Software Extension Policy: Open Source Policy* (juliol de 2016). Available online at *https://www.ict.govt.nz/guidance-and-resources/open-government/new-zealand-government-open-access-and-licensing-nzgoal-framework/NZGOAL-SE*

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*Software* Freedom Law Centre (2008) *A Legal Issues Primer for Open Source and Free Software Projects*. Available online at *http://www.softwarefreedom.org/resources/2008/foss-primer.html*