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Spanish Public Procurement: legislation, open data source and extracting valuable information of procurement announcements

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Abstract

Open Data in Public Administrations and, in particular, the publications of public procurement (tenders) is a source of valuable information for the decision-making procedure. The analysis of public tenders can provide valuable information for the different stakeholders: politicians, public managers, project managers, executives and, indirectly, citizens. Open Data allows the application of Business Intelligent and massive data processing techniques. This study presents the current situation of the Spanish Public Procurement processes and its open data sources available for citizens. The focus of the study is the Request-For-Proposal (RFP) and tender submission related data. The European and Spanish legislation which applies to this topic is collected. The Spanish Public Sector Contracting Platform, which is the web platform where public procurement announcements and their resolutions are published, is explained. The information can be very useful for researchers who want to carry out studies applying massive data processing techniques. A use case is presented using the open data of that web platform with different approaches to demonstrate its usefulness in a Business Intelligent context. Examples describing quantitative, geographic, sectorial competitiveness and interregional mobility analysis are presented illustrating possible applications.

Keywords: Public Procurement; E-Procurement; Open Data Government; Open Data Use; Award of Public Contracts; Spanish Tenders.

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1. Introduction

Open data is data that can be freely used, shared and built-on by anyone, anywhere, for any purpose (definition retrieved from Open Knowledge Foundation, https://okfn.org/projects/open-definition/, 2019). Open data is based on 8 principles to ensure that data must be complete, primary, timely, accessible, machine processable and license-free, access must be non-discriminatory and formats must be non-proprietary. Topics associated with open data have grown very strongly in the academic field [1], especially in the last decade (from 13 papers published in 2010 to 375 papers published in 2017 [2]). This is due to the utility (direct or indirect) of these analyses to obtain new valuable information [3, 4] for stakeholders.

E-Government is the government's use of technology to enhance the services it offers to other entities, including citizens, business partners, employees, and other government agencies [3]. E-Procurement refers to the use of electronic communications to deal with purchasing and procurement business processes. E-government services provide the ability to make online payments, create online tenders and initiate online contact with different stakeholders.

There is an increasing number of government initiatives associated with open data [5], analyzing and comparing them with models such as the e-government Openness Index [6] or the Democratic e-Governance Website Evaluation Model (DEWEM) [7]. The U.S.A. Government was one of the pioneers in taking seriously open data, opening a web portal in 2009 for this purpose called data.gov [8]. Thanks to the large amount of open data available, its economic value is being explored and business models are being created (so called Open Data Business Models) [9].

Open data associated with public procurement is also increasing mainly due to technological factors (development of models and software for e-Procurement [10]), bureaucratic factors (standardization of contracting language and Public Administrations digitalization), political factors (greater transparency in political decision making), economic factors (globalization, companies competing in markets far away from their origin) and social factors (less tolerance for inefficient political management and greater transparency about contracting information between Public Administrations and private companies).

There are many social groups with direct or indirect interests in Open Data [11, 12]. Open data provision models are also an object of study [13], from an unidirectional model where the government is a simple data provider to a bidirectional model where citizens also provide data and both parties are enriched by this mutual information [7].

Open Government Data (OGD) can be described as a subset of open data that is produced or commissioned by government or government-controlled entities. OGD is closely related to the concept, also widely studied, of Freedom of Information (F.O.I.) [14]. In [15] and [16] the benefits are shown when designing OGD. The political and social benefits include greater transparency and accountability [11], greater confidence in the government, better policy formulation processes, creation of new ideas within the public sector, etc. The economic benefits are growth and competitiveness, promotion of innovation, better processes and services, useful information for investors and companies, etc. However, releasing government data also has risks and barriers [1]. You can obtain private or sensitive information by analyzing the published data with big data and machine learning techniques [17]. Governments have to ensure the protection of the privacy of the data of their citizens and companies before releasing them.

The uses or applications of the analysis of open data in public procurement (or also called tenders) are very diverse: public procurement advertised in the Official Journal of the European Union (OJEU) as % of GDP. [18], participation of citizens in political decision-making [19] or even prediction of war's state [20]. In addition, many studies about e-procurement have been conducted globally but there is a dearth of studies that look at the electronic procurement processes, specially in Spain. Hence, this study fills that gap in literature.

This article is divided into three sections to understand the processes of public procurement and finally extract valuable information: European and Spanish legislation on public procurement, open data source (Official Journals and the Spanish Public Sector Contracting Platform – PSCP) and open data stored on the PSCP to extract information.

2. European and Spanish legislation on public procurement and on the re-use of public information

At the European and Spanish levels, laws have been developed related to the re-use of public sector information and procurement or contracting in the public sector [21] which have been summarized in Table 1.

According to *Spanish Law 20/2013*, the public procurement notices and their resolutions of all contracting agencies belonging to the Spanish Public Sector must be published on the website of the Public Sector Contracting Platform (PSCP) of Spain. Similarly, the Autonomous Communities, which are Spanish political and administrative division, can publish their contractor profiles through their own websites or in the PSCP in accordance to *Spanish Law 9/2017*. Local administrations, as well as their related or dependent entities, can publish their contractor profiles on the Autonomous Communities platforms or directly in the PSCP. If Autonomous Communities or Local administrations publish their contractor profiles outside the PSCP, they have to publish in PSCP through aggregation mechanisms the public procurement notices and their resolutions.

The information of public procurement notices is defined in *Spanish Law 9/2017*, Annex III "Information that has to appear in the announcements". PSCP has an open data section for the re-use of this information (in compliance with the publicity obligations established in *Law 9/2017*) and which will be used in this article (section 4).

In regard to official announcements of Spanish tenders outside Spain, Article 135 of *Law 9/2017* establishes that when tenders are subject to harmonized regulation (those with an amount greater than a threshold or with certain characteristics, stipulated in Articles 19 to 23), tenders have to also be published in the OJEU [22]. When the public contracting authority considers it is appropriated, tenders not subject to harmonized regulation can be announced in the OJEU. The Europe Union (EU) has an Open Data Portal [23] which was set up in 2012, following Commission Decision 2011/833/EU on the reuse of Commission documents. All EU institutions are invited to make their data publicly available whenever possible. Furthermore, there is a portal called Tenders Electronic Daily (TED) [24] dedicated to European public procurement. It provides free access to business opportunities from the EU, the European Economic Area and beyond.

Table 1. Laws about public procurement and the re-use of public sector information.

Law	Description	Level	Permanent link
Directive 2003/98/EC	Re-use of public sector information.	Europe	http://data.europa.eu/eli/dir/2003/98/oj
Directive 2013/37/EU	Modifying previous Directive 2003/98/EC.	Europe	http://data.europa.eu/eli/dir/2013/37/oj
Directive 2007/2/EC	Establishing an Infrastructure for Spatial Information in the European Community (INSPIRE).	Europe	http://data.europa.eu/eli/dir/2007/2/oj
Law 37/2007	Transposing into Spanish Law the European Directive 2003/98/EC.	Spain	https://boe.es/eli/es/l/2007/11/16/37
Royal Decree-Law 1495/2011	Developing the Spanish Law 37/2007.	Spain	https://boe.es/eli/es/rd/2011/10/24/1495
Commission Decision 2011/833/EU	On the reuse of Commission documents.	Europe	http://data.europa.eu/eli/dec/2011/833/
Law 19/2013	Transparency, access to public sector information and good governance.	Spain	https://boe.es/eli/es/l/2013/12/09/19
Law 20/2013	Market unit guarantee.	Spain	https://boe.es/eli/es/l/2013/12/09/20
Law 18/2015	Transposing into Spanish Law the European Directive 2013/37/EU.	Spain	https://boe.es/eli/es/l/2015/07/09/18
Directive 2014/23/EU	Award of concession contracts.	Europe	http://data.europa.eu/eli/dir/2014/23/oj
Directive 2014/24/EU	Public procurement.	Europe	http://data.europa.eu/eli/dir/2014/24/oj
Law 9/2017	Transposing into Spanish law the previous European Directives 2014/23/UE and 2014/24/UE.	Spain	https://boe.es/eli/es/l/2017/11/08/9

3. Open data source: Official Journals and the Spanish Public Sector Contracting Platform

The official journal is a periodical publication that has been authorized by a State or public organization to publish legal notices and other public acts such as public tenders. In Spain there is the Official State Journal called BOE and also an official journal for each Autonomous Community.

According to Article 135 of *Law 9/2017*, tender's announcement for the award of public contracts (with the exception of negotiated procedures without publicity) will be published on the website of the procurement platform (also called contractor profile). Tenders that belong to the General State Administration, or public entities related to it, will also be published in the BOE. Therefore, it is not mandatory to include procurement announcements in the official journal of each Autonomous Community.

According to the legislation described in the previous section, PSCP stores directly or aggregated all tender's announcements published by the Spanish Public Administration. The aggregation is a mechanism that allows those public contracting authorities which do not publish directly their contractor profile in the PSCP, to add the public procurement notices and their resolutions in PSCP. It is shown in Table 2. for each Autonomous Community its official journal, its public procurement platform website and if its platform is directly hosted or aggregated to the PSCP.

Table 2. Official Journals of Spain and Autonomous Communities and their public procurement platform websites.

Autonomous Community Official Journals	**Official Journal website**	**Public procurement platform website**	**Hosted in PSCP?**
Official State Journal (BOE)	www.boe.es	https://contrataciondelestado.es (**PSCP**)	Yes
O.J. of Junta de Andalucía (BOJA)	www.juntadeandalucia.es/boja	www.juntadeandalucia.es/temas/contratacion-publica.html	Aggregated
O.J. of Aragón (BOA)	www.boa.aragon.es	www.aragon.es/Contratacion	Yes
O.J. of Asturias (BOPA)	https://sede.asturias.es	https://sede.asturias.es/perfilcontratante	Aggregated
O.J. of Islas Baleares (BOIB)	http://boib.caib.es	http://www.plataformadecontractacio.caib.es	Yes
O.J. of Canarias (BOC)	www.gobcan.es/boc	www.gobiernodecanarias.org/perfildelcontratante	Yes
O.J. of Cantabria (BOC)	https://boc.cantabria.es/boces	www.cantabria.es/perfil-contratante	Yes
O.J. of Castilla - León (BOCYL)	http://bocyl.jcyl.es	https://contratacion.jcyl.es	Yes
O.J. of Castilla - La Mancha (DOCM)	http://docm.castillalamancha.es	https://contratacion.castillalamancha.es	Yes
O.J. of Catalunya (DOGC)	https://dogc.gencat.cat	https://contractaciopublica.gencat.cat	Aggregated
O.J. of Junta de Extremadura (DOE)	http://doe.juntaex.es	https://contratacion.gobex.es	Yes
O.J. of Generalitat Valenciana (DOCV)	www.docv.gva.es	www.contratacion.gva.es	Yes
O.J. of Galicia (DOG)	www.xunta.gal/diario-oficial-galicia	www.contratosdegalicia.gal	Aggregated
O.J. of Madrid (BOCM)	www.bocm.es	http://www.madrid.org/cs/Satellite?&pagename=PortalContratacion%2FPage%2FPCON_home	Aggregated
O.J. of Murcia (BORM)	www.borm.es	http://www.carm.es/web/pagina?IDCONTENIDO=709&IDTIPO=140&RASTRO=c$m	Aggregated
O.J. of Navarra (BON)	www.navarra.es/home_es/Actualidad/BON	https://portalcontratacion.navarra.es	Aggregated
O.J. of País Vasco (BOPV)	www.euskadi.eus/y22-bopv/es	http://www.contratacion.euskadi.eus	Aggregated
O.J. of La Rioja (BOR)	www.larioja.org/bor	www.larioja.org/contratacion-publica	Aggregated
O.J. of City de Ceuta (BOCCE)	www.ceuta.es/ceuta/bocce	http://web.ceuta.es:8080/contratacion	Yes
O.J. of City de Melilla (BOME)	www.melilla.es/melillaportal	www.melilla.es/melillaportal/contratante	Yes

PSCP's information is generated by the General Directorate of State Property from data that public contracting authorities enter as responsible for their contractor profiles. The number of Public Administrations that have their contractor profile in PSCP has been growing progressively, mainly in 2017 and 2018. Tender's announcements are updated daily and added to files monthly and annually, with data from 2012. The format file is XML and its extension is .atom. Its internal structure of fields is defined in the document "*Format of syndication and re-use of data on tenders*

published in the PSCP" accomplished by the General Sub-Directorate for the Coordination of Electronic Procurement. Some important fields are tender status, purpose of the contract, estimated tender amount (€), CPV (Common Procurement Vocabulary) code, place of execution, identity of the successful bidder, award amount (€), number of participating bidders, offers received, contract modifications, etc.

Many approaches could be done with this information: from the point of view of Public Administrations and public expenditure, tender's geographical location, sectors with greater public procurement, business competition (number of companies that bid for each tender), characteristics of the companies that win more tenders (type of company, main business sector, nationality), maximum and minimum bid prices of each tender, deviation of prices, etc. These approaches are very useful for politicians and public managers and also for project managers and general managers of private companies because they have more valuable information to make sound decisions and develop their political and business strategy, respectively. And ultimately, citizens know where their taxes are spent and can also, to a certain extent, supervise actions of both groups (politicians and businessmen) guaranteeing the free market.

4. Use case: open data stored on the Public Sector Contracting Platform of Spain (PSCP)

The open data repository [25] used in this analysis are tenders hosted directly in the PSCP, excluding minor contracts (smaller amount than a maximum fixed by law). The source data (.atom files in XML format) has been transformed into a SQL database. Furthermore, the data has been filtered and cleaned because the fields are filled without format or previous automatic validation or, what is worse, the field is empty. Data's quality and its metadata is an important topic in Open Data [5, 26, 27]. For example, errors or omissions of NIF (tax identification number of Spain) and company names have been detected. Additionally, useful derivative fields have been calculated for this analysis. For example, postal code and NIF have been used to obtain geographic coordinates.

The resulting data are 285.891 awarded or resolved tenders within the timeframe from 2012 to 2018, an aggregate tender amount of 201.868 M€ (including taxes) and 38.199 winner companies of tenders. Several types of analysis have been made which exemplify the potential use of this set of data and, thus, valuable information is extracted for economic agents. The following analyzes are presented as example of how the data can be exploited from the Business Intelligent perspective.

- **Quantitative analysis**. Fig. 1. shows the number of tenders awarded per quarter from 2012 to 2018. The increase in the number of tenders over time is not due to a purely economic factor (Spain was emerging from an economic recession) but also due to the fact that more and more Public Administrations have joined in PSCP.
- **Geographic analysis**. In Fig. 2, all published tenders (adjudicated or not) are shown by geographical location. They are shown by the public entity's postal code which has called the tender. Note that it could be a different location where the works or services are really executed. Note also that not all public administrations publish their tenders directly in the PSCP (mentioned in the previous section) obtaining geographical areas without tenders.
- **Sectorial analysis (CPV)**. Fig. 3. shows the aggregate amount (% of total) of the awarded tenders separated by CPV. This analysis gives us an idea of the jobs which have the most public expenditure. The 4 CPVs with the highest expenditure are: 45-Construction work (29.28%), 50-Repair and maintenance services (9.68%), 85-Health and social assistance services (8.59%) and 71-Architectural services, construction and engineering (6.29%).
- **Competitiveness analysis**. Fig. 4. shows the average number of companies that make a tender separated by CPV. This analysis gives us an idea of the competitiveness between companies to win a tender in each sector. The 4 CPVs with the highest competitiveness are: 45-Construction work (10.68 companies) 71- Architecture, construction and engineering services (9 companies), 65-Public services (7.75 companies) and 77-Agricultural and forestry services (6.08 companies).
- **Interterritorial mobility analysis**. In Fig. 5. a graph is shown which relates the location of the Public Administrations that calls the tender (external ring) with the location of the winning company of the tender (internal ring). This analysis gives us an idea of the territorial mobility of the winning companies. For example, the Autonomous Community of Madrid has the highest number of tenders, 121.295 in total (external ring). More than half, 72.409 tenders, have been won by companies from Madrid (corresponds to internal ring, same color as external ring) and the rest by companies from other Autonomous Communities.

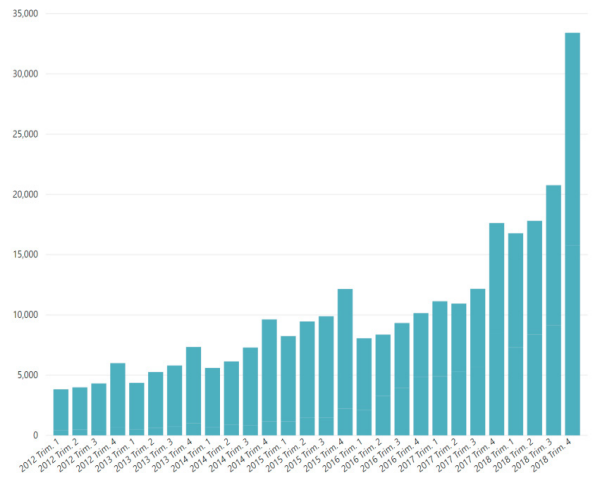

Fig. 1. Tenders awarded per quarter from 2012 to 2018.

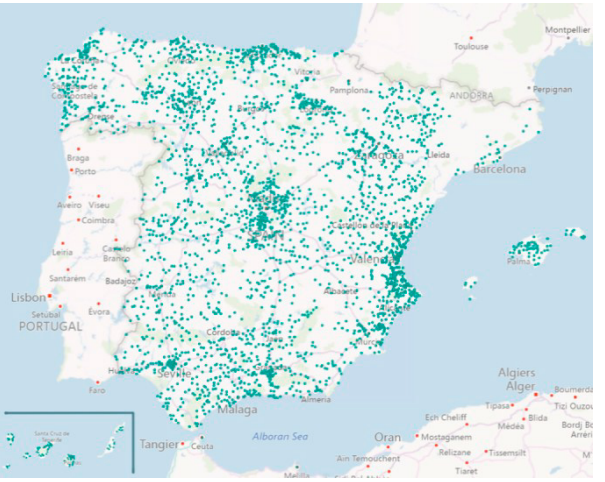

Fig. 2. Awarded tenders by geographical location (green points).

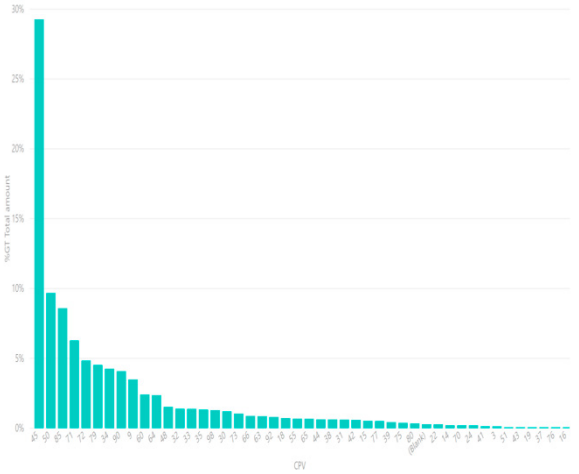

Fig. 3. Aggregate amount (% of total) of the awarded tenders by CPV.

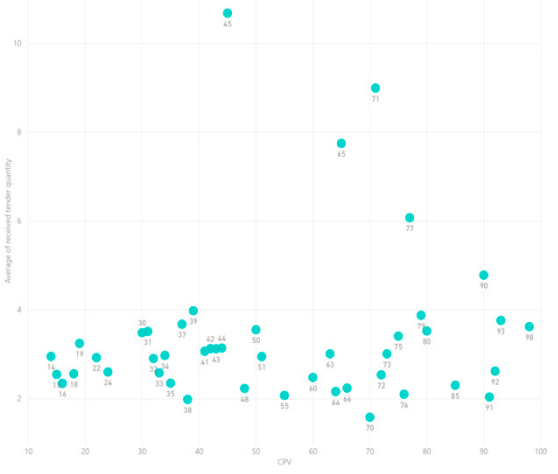

Fig. 4. Average number of companies that make a tender by CPV.

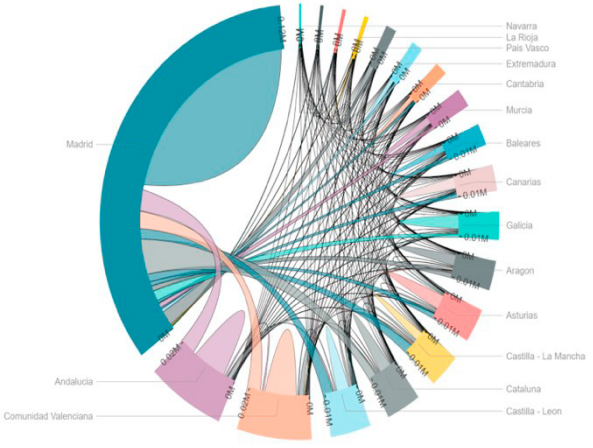

Fig. 5. External ring: number of tenders by regions (Autonomous Communities). Interior ring: number of tenders won by companies according to their region of origin.

Company Winner	Total amount (€)	%GT Total amount	Number of tenders won
	9.479.864.660,08	4,70%	12128
DKV SEGUROS Y REASEGUROS SL	6.562.934.448,00	3,25%	6
SEGURCAIXA ADESLAS SA	4.107.989.053,60	2,03%	50
PATENTES TALGO SL	3.215.073.975,00	1,59%	31
ASISA ASISTENCIA SANITARIA INTERPROVINCIAL DE SEGUROS SAU	3.041.800.814,60	1,51%	43
CINTRA INFRAESTRUCTURAS SA ACCIONA INFRAESTRUCTURAS SA Y MERIDIAM INFRAESTRUCTURE FINANCE II SARLUTE	2.712.420.096,00	1,34%	2
INDRA SISTEMAS SA	2.338.827.854,98	1,16%	2011
CLECE SA	1.638.999.916,69	0,81%	1470
VIAS Y CONSTRUCCIONES SA	1.504.831.560,30	0,75%	221
INTERNATIONAL BUSINESS MACHINES SA	1.407.052.096,63	0,70%	161
IVECO ESPAÑA SL	1.350.080.755,60	0,67%	141
AIRBUS HELICOPTERS ESPAÑA	1.150.889.984,00	0,57%	1
ACCIONA INFRAESTRUCTURAS SA	1.136.404.127,30	0,56%	226
SACYR CONSTRUCCION SA VIAS Y CONSTRUCCIONES SA CORSANCORVIAM SA Y SOCIEDAD GENERAL DE OBRAS SA SOGEOSA EN UTE	1.042.435.040,00	0,52%	5
FERROVIAL AGROMAN SA	991.193.853,37	0,49%	284
SOCIEDAD ESTATAL CORREOS Y TELEGRAFOS SA	972.195.850,56	0,48%	288
DRAGADOS SA	965.376.701,23	0,48%	321
ENDESA ENERGIA SAU	944.581.771,61	0,47%	279
UTE INDRA SA NAVANTIA SA	811.884.000,00	0,40%	6
UTE INAER HELICOPTEROS SAU INAER HELICOPTEROS OFF SHORE SAU Y TRANSPORTES AEREOS DEL SUR SAU	800.000.000,00	0,40%	5
TELEFONICA DE ESPAÑA SAU	790.290.972,62	0,39%	302
CONSTRUCCIONES SANCHEZ DOMINGUEZ SANDO SA; COPISA CONSTRUCTORA PIRENAICA SA UTE	787.904.960,00	0,39%	5
GAS NATURAL COMERCIALIZADORA SA	777.111.260,20	0,38%	631
UTE DRAGADOSTECSAAMENABAR	766.992.000,00	0,38%	3
RETEVISION I SA	758.241.874,00	0,38%	67
Total	**201.867.907.291,54**	**100,00%**	**285891**

Fig. 6. Top 25 companies with the highest aggregate award amount (€), % (aggregate award amount with respect to total) and number of tenders won by each company.

- **Business analysis**. Fig. 6. shows the top 25 companies with the highest aggregate award amount (€) and % (aggregate award amount with respect to total). In addition, the number of tenders won is shown. The first blank row is due to the tenders without winning company information. Sectors of the top 25 companies are: insurance, construction, transport (rail, naval, aeronautical and road), services (maintenance, security, cleaning, etc.), energy, courier, IT and electronics. It is surprising that all are Spanish companies except 3 foreigners. There are 5 Temporary Business Unions (called UTEs), which is the union of two or more companies to carry out a specific project. Note that companies are shown by their corporate name. Corporations or business groups with several companies or brands do not appear together or aggregated in this table.

5. Conclusions

This article has explained the legislation, approaches and applications of open data generated by the Spanish Public Procurement. It has been made a compilation of European legislation and its application to Spanish laws about public procurement and the re-use of public sector information. European and Spanish legislation requires greater transparency and digitalization of the Public Administrations and particularly in public procurement. It has become clear that in the period from 2012 to 2018 more and more Public Administrations have joined to the Public Sector Contracting Platform of Spain.

The publishing process of public tenders in Spain has been introduced. Originally in Official State (paper format) and nowadays it has evolved to webs of Contracting Platforms (electronic format) which make possible a massive data extraction.

The collection of sources identified in this study can be an important aid for all those who want to carry out further studies involving massive data processing with Big Data and Machine Learning algorithms. Thanks to open data sources of public procurement, those studies no longer depends on Government Statistics Offices such as the Spanish called INE [28] or the European called Eurostat [29]. Therefore, anyone has the resources to perform low-level independent analysis or even cross data with other databases or external services to extract more valuable information.

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