Preliminary Notes on Open Data Licensing

Stefano Leucci*

Abstract. Open data is fuel for the future economy. Opening and sharing data owned by public bodies, communities and companies has an incredible economic value. This will potentially lead our society to a new data-driven thinking paradigm. They also enable a smarter urban space where companies can provide better and innovative services. In particular, accessing to government data held by public bodies generates accountability, transparency and fosters economic growth. Two main aspects define data as open: data formats and licenses. This paper aims at listing some preliminary notes on the copyright framework in which open data are released and presenting the idea of considering licenses as metadata. Many tools, according to the semantic web paradigm, aim at enforcing this aspect, managing data exchange in a more compliance way and reducing costs for reuse of data. Finally, a research path for a new approach to digital ownership will be presented.

Keywords: IPRs, copyright, copyleft, open data, right expression language

1. The Open Data Paradigm

In the last few years, thanks to the increased power available in computation, «it is possible to make open digital information "liquid" and shareable to an unprecedented degree»[1]. Open data is «accessible public data that people, companies, and organisations can use to launch new

* The Author is a Ph.D. Candidate at the ICT Doctoral School of the University of Trento, where he is a member of the KnowDive research group (http://disi.unitn.it/~knowdive/). His main research interests are data protection, privacy and identity management in the semantic web environment. Due to his background in Law, he focuses his work on the transdisciplinary aspects. He is currently a Fellow of the Nexa Center for Internet and Society of the Polytechnic of Turin and he works as legal advisor in the Open and Big Data Project of the Autonomous Province of Trento and TrentoRise.

1 Manyika, J., Chui, M., Groves, P., Farrell, D., Van Kuiken, S., Doshi, E. A., *Open data: Unlocking innovation and performance with liquid information*, McKinsey, 2013, p. 4. Available at: http://www.mckinsey.com/insights/business_technology/open_data_unlocking_innovation_and_performance_with_liquid_information.

ventures, analyse patterns and trends, make data-driven decisions, and solve complex problems»[2]. Well established literature defines open data as fuel for future economy[3]. Different insights coming from European agencies[4] demonstrate that open data can create economic value, both in terms of revenue and savings and in economic surplus. Releasing open data is a matter of increasing societal efficiency, and its value is in reuse[5]. Sharing data «has the potential to unlock large amounts of economic value, by improving the efficiency and effectiveness of existing processes; making possible new products services, markets; and creating value for individual consumers and citizen»[6]. Open data is adding a new dimension to big data analytics[7] and promoting a new data-driven economy. Moreover, open data

2 Gurin, J., *Big data and open data: what's what and why does it matter?*, The Guardian 15.04 (2014). Available at: http://www.theguardian.com/public-leaders-network/2014/apr/15/big-data-open-data-transform-government.

3 Eggers, E., Hamill, R., Ali, A., *Data as the new currency – government's role in facilitating the exchange*, Deloitte Review, no. 13, 2013. Available at: http://dupress.com/articles/data-as-the-new-currency/.

4 Agencies all over the word published reports related to the quantification of the potential economic value that has to be extracted from the data: Pira International (2000) estimates for the value around €68 billion annually; Mepsir Eu (2006) publishes that the overall market for public sector information in the European Union is €26.1 billion; Vickery/EU Commission (2011) defines the current total direct and indirect economic value of public sector information at €140 billion per year for the EU27; McKinsey (2013) estimates that the potential value can be shared between the United States ($1.1 trillion), Europe ($900 billion) and the rest of the world ($1.7 trillion). Pira International, *Commercial exploitation of Europe's public sector information,* European Commission Report, Surrey, England, 2000. Dekkers, M., Polman, F., Te Velde, R., De Vries, M., *Final Report of Study on Exploitation of public sector information - benchmarking of EU framework conditions,* MEPSIR- Measuring European Public Sector Information Resources, European Commission, 2006. Vickery/EU Commission, (2011), available at: http://www.epsiplatform.eu/content/review-recentpsi- re-use-studies-published. Manyika, J., et al, *Open data,* cit., p. 6.

5 Tinholt D., *The Open Data Economy: Unlocking Economic Value by Opening Government and Public Data*, Capgemini Consulting, 2013. Available at: http://www.capgemini-consulting.com/resource-file-access/resource/pdf/opendata_pov_6feb.pdf.

6 Manyika, J., et al, *Open data,* cit., p. 12.

7 Big data and open data phenomenon are closely related. Big data is about mixing technology coming from different computer science domain (mainly, cloud computing and database) for obtaining answers to complex queries on data. The quality of answers and the quantity of possible queries are directly connected with quality and quantity of data available. For a better understanding of the connection between big data and open data see Gurin, J., *Big data and open data,* cit.

is «actionable intelligence»[8] and it requires specific education about the power of a data-driven culture[9].
Three actors can mainly provide open data: governments like the Autonomous Province of Trento[10], corporations like Enel S.p.a.[11] and communities like OpenStreetMaps[12].
Public Sector Information (PSI), that is «data and information held by public bodies»[13], has been compared to an open pit[14] from which many data can be extracted and shared as open government data. The public sector collects, produces, reproduces and disseminates a wide range of information in many areas of activity, e.g., social, economic, geographical, weather, tourist, business, patent and educational information. Wider possibilities of reusing public sector information could allow European companies to exploit its potential and contribute to economic growth and job creation. The movement became a shared policy after the Directive no. 2003/98/CE (Public Sector Information Directive), improved by the Directive no. 2013/37/UE. In the specific domain of geo-data, Europe adopted a shared policy – including also data structure with the Directive no. 2007/2/CE (INSPIRE Directive). Nowadays, data are becoming public data «that people, companies, and organizations can use to launch new ventures, analyze patterns and trends, make data-driven decisions, and solve complex problems»[15]. Opening data can also improve public transparency, generate insights into how to improve government

8 Hammer, C., *Open data has little value if people can't use it*, Harvard Business Review Blog Network, 29.03 (2013). Available at: http://blogs.hbr.org/2013/03/open-data-has-little-value-if/.

9 Giles, J., Stahl, G., *Fostering a data-driven culture*, Economist Intelligent Unit, 2013, p. 5. Available at: http://www.economistinsights.com/sites/default/files/legacy/mgthink/downloads/Tableau_DataCulture_130219.pdf.

10 The Open Government Data Catalougue of the Autonomous Province of Trento is available at: http://dati.trentino.it/.

11 The Open Data Portal from Enel S.p.a. is available at: http://data.enel.com/.

12 Data are available at: http://www.openstreetmap.org/.

13 European Commission, *Public sector information: a key resource for europe – green paper on public sector information in the information society,* COM(1998)585, 1998. Available at: http://aei.pitt.edu/1168/.

14 Morando, F., Iemma, R., Artusio, C., *Libro bianco per il riutilizzo dell'informazione del settore pubblico*, EVPSI Project – Extracting Value from Public Sector Information, 2012. Available at: http://www.evpsi.org/librobianco.

15 Gurin, J., *Big data and open data,* cit.

performance and fight corruption[16]. Recently, the G8 Global Summit approved the Open Data Charter where they «recognise [that] the benefit of open data can and should be enjoyed by citizen of all nations»[17].
The second actor in the open data landscape is companies. A concrete example of open companies data comes from Enel S.p.a.[18], sharing data about energy consumption. In the future, data will become the foundation for «a new kind of data philanthropy, persuading private companies with large troves of big data to donate datasets for social good»[19]. It is finally clear that data is «raw public good, and we must work together to find ways to harness it for massive social impact, both safely and responsibly»[20].
Finally, communities on the web usually share data for their reuse. An example is the OpenStreetMaps community. Many applications were built above this data, and there is some on the web that used OSM data to create tablecloths and blankets[21].
I can now choose the broad definition of open data, published by Open Knowledge Foundation: «a piece of data or content is open if anyone is free to use, reuse, and redistribute it — subject only, at most, to the requirement to attribute and/or share-alike»[22]. Technical aspects are strictly related to legal issues, mainly concerning correct licenses to ensure the freedom in reuse. If data are «made available in formats which disable its linkability to other data sets or on conditions which restrict its reusability in connection with other data sets, then the very purpose of reuse may be defeated»[23].
This paper will concentrate on different licensing approach for open data. Then, I will go through a preliminary state of the art in the semantic web

16 Ubaldi, B., *Open government data: Towards empirical analysis of open government data initiatives,* Technical report, OECD Publishing, 2013. Available at: http://www.oecd-ilibrary.org/governance/open-government-data_5k46bj4f03s7-en.

17 Full text of the G8 Open Data Charter is available here: http://www.agid.gov.it/notizie/adottato-il-g8-open-data-charter.

18 A brief description of the open data policy implemented inside Enel S.p.a. is available here: http://saperi.forumpa.it/story/63581/enel-si-converte-allopen-data-e-pubblica-tutti-i-suoi-dati-formato-aperto.

19 Manyika, J., et. al., *Open data,* cit., p. 21.

20 Kirkpatrick, R., *A new type of philanthropy: donating data*, Harvard Business Review Blog Network, 21.03 (2013). Available at: http://blogs.hbr.org/2013/03/a-new-type-of-philanthropy-don/.

21 Insights are available here: http://pistilsf.com/.

22 The definition is available here: http://opendefinition.org/.

23 Ricolfi, M., Van Eechoud, M., Morando, F., Tziavos, P., Ferrao, L., *The "Licensing" of Public Sector Information*, in Tiscornia, D., (eds.), *Open data e riuso dei dati pubblici*, Informatica e Diritto, Edizioni Scientifiche, Napoli, 2011, fasc. 1-2. p. 129.

tools for defining licenses in a machine-readable way.

2. Copyright and S*ui Generis* Right

In seeking Italian copyright is governed by Law no. 633/1941. Copyright arises automatically: the author acquires all the rights on the work by simply creating it[24]. Therefore, the authorship of the work is acquired by simple translating the idea into an original work (the thought of a troubled love story was thought both by Dante and Manzoni, but the copyright is different and was born on the two different books they wrote)[25]. As Morando elegantly wrote, «the current default rule is full protection for the maximum possible duration allowed by the law and with all right reserved to the author»[26]. Broadly speaking, copyright does not apply to the mental idea of a video, but to the video file itself. The copyright is technically tied to the concept of an exclusive right that is expressed by the Latin phrase «*jus excludendi alios*». This is the possibility to exclude others from any use of the intellectual work that is not allowed by the author. Finally, copyright can be seen as «a natural or moral right of the creator to be recognized as such and to control certain uses of the fruit of his work»[27]. Those are incentives, that have to be balanced with *ex ante* and *ex post* costs[28].

Three requirements are necessary for ensuring copyright exclusivity to the author. Firstly, the kind of work has to be listed in the Art. 2 of the Italian Copyright Law as a type of work on which the copyright arises. Secondly, the work must be original. This means that the work must be the result of a

24 The articles that have to be taken into accont are: Art. 2576 of the Italian Civic Code and the Art. 6 of the Law no. 633/1941 (Italian Copyright Law).

25 Auteri, P., *Diritto d'autore*, in Aa.Vv., *Diritto industriale. Proprietà intellettuale e concorrenza*, Torino, Giappichelli, 2005, Section VI, p. 505.

26 Morando, F., *Creative Menus: applying some considerations about default rules and contractual menus to the case of Creative Commons Licenses*, in Flanagan, A., Montagnani, M. L., (eds.), *Intellectual Property and Social Justice: a Law and Economics Approach*, Edward Elgar Publishing, 2009, p. 218.

27 *Ibidem*.

28 The main *ex ante* cost is the investment made by the creator in order to produce the intellectual work. Typical ex post costs are transaction costs, costs of monitoring, enforcement costs and litigation costs. For a Law&Economic approach in the copyright analysis, see Landes, W., Posner, R., *An economic analisys of copyright law*, in 18 J. Legal Studies, 1989, p. 325; Lemley, M., *Ex ante versus ex post justifications for intellectual property*, University of California – Berkeley, Public Law and Legal Theory Research Paper Series (Paper No. 144), 2004.

particular intellectual work and should reflect the imprint of the author's personality[29]. Finally, the work must be innovative, in the sense that the work has to be different from other work of the same kind[30]. Copyright lasts 70 years after the author's death. This term refers to the publishing works, which is the area where copyright historically was created and developed.

Nowadays, copyright has spread to other types of intellectual works that are truly innovative and unimaginable even a few decades ago; software and databases are the two main examples. I will now focus my survey on databases copyright issues; indeed «databases have become an essential part of cultural and technical production»[31]. For a better understanding of the phenomenon, differences between data and databases have to be taken into account. According to the Oxford English Dictionary, data are «facts and statistics collected together for reference or analysis». Moreover, databases are «a structured set of data held in a computer, especially one that is accessible in various ways». Semantically speaking, databases are a set of data contained in a computer system. These data can refer to simple and non-copyrighted facts or to copyrighted works.

On the regulation level, lawyers had many trouble[32] in protecting databases under copyright law before the year 1996. The reason was the lack of the most important criterion: the creativity. Databases, to be useful for the user, have to be exhaustive. Data have to be organized in a certain order which allows finding them: it may be a trivial alphabetical order or a dense network of links and references[33]. This will easily lead to loss of originality and, consequently, copyright law cannot cover them. In this scenario, copyright law covered few databases with a very creative way of organizing data. The special feature of this category to be considered is that the requirement of creativity is not to be found in the expressive

29 Aliprandi, S., *Capire il copyright*, Primora, 2007, p. 40. Available at: http://www.aliprandi.org/capire-copyright/.

30 *Ivi*, p. 48.

31 Aliprandi, S., *Open licensing e banche dati*, in Tiscornia, D., (eds.), *Open data e riuso dei dati pubblici*, Informatica e Diritto, Edizioni Scientifiche, Napoli, 2011, fasc. 1-2, p. 29.

32 Some references can be found in Di Minco, S., *La tutela giuridica delle banche di dati. Verso una direttiva comunitaria*, Informatica e Diritto, Edizioni Scientifiche Napoli, 1996, fasc. 1. p. 208.

33 Dal Poggetto, P., *La protezione giuridica delle banche dati mediante il diritto d'autore ed il diritto sui-generis*, Informatica e Diritto, Edizioni Scientifiche, Napoli, 1997, fasc. 1, p. 159.

characteristics of the collection of individual works, but in the policy by which the author (database maker) operates the collection. Trouble are also related to the trouble in defining borders between creative and non-creative databases.

Moreover, building a database is an expensive and requires hard work involving a lot of investments in money and in human labour. This activity is costly solely for the first creator of the database, and not for those who simply copy portions of it.

Taking into account all these complex problems, the U.S. approach to database protection was defined in the well known Feist vs. Rural law case. It illustrates the problem as follows: «known alternatively as sweat of the brow or industrious collection, the underlying notion was that copyright was a reward for the hard work that went into compiling facts. […] it extended copyright protection in a compilation beyond selection and arrangement – the compiler's original contributions – to the facts themselves […]. Sweat of the brow Courts thereby eschewed the most fundamental axiom of copyright law: that no one may copyright facts or ideas»[34].

This uncertain legal framework finally convinced the European Parliament[35] that investments made by companies for building databases had to be protected and encouraged[36]. European Directive 96/9/CE (DB Directive) aims at defining a clear copyright protection for databases. Thanks to the internalization of the Directive, databases are now under the Art. 2 of the Italian Copyright Law. According to this legal innovation, a

34 U.S. Supreme Court, *Feist Publications Inc. v. Rural Telephone Service Co. Inc.*, 499 US 340 (1991). For a deeper understanding of the lawcase see Ginsburg, J., *No sweat? Copyright and other Protection of Works of Information After Feist v. Rural*, in Columbia L. Rev., 1992, p. 338.

35 Even the United States, world leaders in databases technology, have not adopted an *ad hoc* discipline as the European Community. One could argue that the DB Directive presents certain peculiarities in order to give European companies a suitable instrument to counter the dominance of the U.S. Dal Poggetto, P., *La protezione giuridica delle banche dati,* cit., p. 159.

36 This evidence comes out from a deep analyze of the Recital 7 and 12 of the DB Directive: «whereas the making of databases requires the investment of considerable human, technical and financial resources while such databases can be copied or accessed at a fraction of the cost needed to design them independently» and «whereas such an investment in modern information storage and processing systems will not take place within the Community unless a stable and uniform legal protection regime is introduced for the protection of the rights of makers of databases».

double layer of protection for databases is now available. The first layer is about the classic copyright protection granted to the author of a particular and creative data organization. The second layer is called "*sui generis"* right and relies on databases where creativity criterion lacks. This right is granted to a particular subject called "maker" of a database as one that made «qualitatively and/or quantitatively a substantial investment»[37]. It runs from «the date of completion of the making of the database» and it expires «fifteen years from the first of January of the year following the date of completion»[38].

In conclusion, the two levels are alternative and non-integrable: this can be inferred from the Art. 3 of the DB Directive: «[...] databases which, by reason of the selection or arrangement of their contents, constitute the author's own intellectual creation shall be protected as such by copyright. No other criteria shall be applied to determine their eligibility for that protection». It is also clear that the contents of the database are licensed in an autonomous way: the copyright protection and the *sui generis* right «shall not extend to their contents». Finally, Aliprandi[39] shows that three scenarios can emerge from the mix of the two layers:

- Creative databases containing creative works: the author of the database holds the copyright on the database structure. Each author of single works holds their own copyright in an autonomous way.
- Creative databases containing data: the author of the database holds the copyright on the database structure. The author is also the maker of the database and can deny extraction and reuse of the whole or of a substantial part of data contained therein.
- Non-creative databases that cointains simple data: the database maker holds the *sui generis* right and can deny others from extraction and reuse of the whole or of a substantial part of data cointained therein.

37 Art. 7, DB Directive: «member States shall provide for a right for the maker of a database which shows that there has been qualitatively and/or quantitatively a substantial investment in either the obtaining, verification or presentation of the contents to prevent extraction and/or re-utilization of the whole or of a substantial part, evaluated qualitatively and/or quantitatively, of the contents of that database».

38 Art. 10, DB Directive: «the right provided for in Article 7 shall run from the date of completion of the making of the database. It shall expire fifteen years from the first of January of the year following the date of completion».

39 Aliprandi, S., *Open licensing e banche dati,* cit., p. 30.

Finally, *sui generis* right is a kind of weakened copyright with fuzzy borders, that arises when the creativity criterion lacks. Now that I defined this complex distinction, I will move to a lower level of abstraction.

3. Licensing Models for Open Data

It is generally known that data has to travel strictly bound with their own license[40]. Copyright law defines a standard right assessment and then every single license aims at specifying agreements between parties. Licenses define how the intellectual work has to be used, modified or redistributed in a more specific way. Without a license, copyright on an intellectual work has fuzzy borders[41]. The final stage is that datasets released by public bodies, companies and communities are collected in public spaces[42], and the main question is «who has ownership of these datasets?»[43].
There are two main different methods for addressing licensing aspects. The default policy in the offline world is the "all-rights-reserved" one, defined as standard in the Italian (and European) Copyright Law[44]. As explained before, the main idea is that the author has the power of exclude others from the reuse of data. Many problems arise in nowadays digitalyzed context. The Web as the main technological innovation for providing data and information changed the means through which intellectual works are provided to consumers. Standard copyright policies are still not sustainable in the digital environment. Digital content creation is difficult and expensive only for the first author, but not for those who merely copy the data collected by him; plus marginal costs are very close to the zero. Every file can be duplicated infinite times without losing quality. Traditional copyright system is undermined, so that new policy proposals came out from the research community[45].

40 Morando, F., *Legal interoperability: making open (government) data compatible with business and communities*, in Ricolfi, M., Sappa, C., (eds.), *Extracting value from public sector information: legal framework and regional policies*, Quaderni del Dipartimento di Giurisprudenza dell'Università di Torino, n. 24, p. 269.

41 For a critical analysis of open data licensing in the context of the public sector information, see Ricolfi, M., et. al., *The "Licensing" of Public Sector Information*, cit., p. 129.

42 Aa.Vv., *Designing for digital ownership in cities*, in Aa.Vv., *Urban interaction design – Towards city making*, Urban IXD Conference Proceedings, p. 74.

43 *Ibidem.*

44 Morando, F., *Creative Menus*, cit., p. 221.

45 Ricolfi, M., *Copyright Policy for digital libraries in the context of the i2010 strategy*, COMMUNIA Conference on the Digital Public Domain – Louvain-la-Neuve (Belgium),

For these reasons, and according to the Open Definition, open data endorses the so-called "copyleft" model, derived from the intuition of Richard Stallman. His idea was to share software and code on the web in a free way, developing a community of interested and actively involved people[46]. He understood that the most effective weapon to defend intellectual work from the "all right reserved" model and consequently guarantee the reuse was in the copyright itself. Making free software is just a matter of declaring freedoms within the license, reversing the role of the license, and moving from strictly denying usage to openly ensuring them to all. From this changing paradigm, many licenses were drafted not only in the software domain, but also for licensing different kinds of intellectual works, e.g., pictures, documents and content on the web. The most relevant open licenses are the General Purpose License and the Free Documentation License from GNU Community[47], the MIT License from the Massachussets Institute of Technology[48] and the Creative Commons licenses[49].

One of the main concepts to consider is the standardization of licenses. Choosing an open license for a project is a matter of using an existing license instead of creating a new one. There are two reasons why existing licenses are better. The first one is familiarity. Using one of the three or four most popular licenses, will not give to reusers the feeling of reading strange legal stuff, because they already have a well known set of duties that the user has to comply with. Secondly, shared licenses have a good level of

2008.

46 For further information, see Raymond, E., *The cathedral and the bazaar*, O'Reilly Media, 1999.

47 G.N.U. (GNU is Not Unix) is an operative system and an open source project on the web, sponsored by Free Software Foundation. To ensure the openess of the code, the GPL (General Purpose License) was drafted by the community. Version no. 3 of the legal text can be read here: http://www.gnu.org/copyleft/gpl.html

48 The MIT License is an open license drafted by the Massachusetts Institute of Technology (MIT). The license is very liberal, allowing also commercial reuse of the work. The legal text can be read here: http://opensource.org/licenses/MIT

49 Creative Commons is a project born from the initiative of legal and computer science scholars in Cambridge, Massachussetts. The main objective is to promote a global debate on new paradigms of copyright management and to diffuse legal and technological tools which can allow for a "some rights reserved" model in cultural products distribution. Licenses are drafted and then "ported" to all contries in the world. Legal texts are available here: http://creativecommons.org/licenses/. Every license is composed by a user friendly "Commons Deed" and a digital machine-readable code expressed through ccREL. More information in Aliprandi, S., *Creative Commons: a user guide*, Ledizioni, 2011. Available at: http://www.aliprandi.org/cc-user-guide/.

quality because they are the result of a lot of shared experience gained from previous errors[50]. Moreover, the Public Sector Information Directive encourages Member State in choosing a standard license for allowing broader legal openness and interoperability[51] of open government data shared on the web.
As I described above, licenses work within the borders of copyright; consequently, two problems arise. On one hand, double protection layers of copyright and *sui generis* right have to be guaranteed by the license. On the other hand, «even the least creative dataset enjoy *sui generis* right protection»[52]. But it is not always the case that the *sui generis* right is "in the scope" of the available standard licenses because the majority of them were drafted in the US legal framework, where double layer of protection for databases is not granted. It is then clear that these licenses work well if the database is creative and protected by the standard copyright. But, «if we were in front of a database released with one of these licenses, we could not feel allowed to use it freely because - without the express inclusion of the text of the license - the rights holder would retain the full and exclusive ownership of the *sui generis* right»[53], according to the "all-right-reserved" default rule. Considering the *sui generis* right, new legal tools have to be taken into account. Next sections will show the main solutions provided by communities on the web. By doing this, I will take into account the open data definition provided by the Open Knowledge Foundation that refers only to minimal legal limitation.
I will organize these licenses according to the extension of freedoms granted to users, starting from the waiver of copyright, passing through the attribution method and finally illustrating the share-alike model.

3.1. Waiver

The first way for sharing data is to waive copyright and *sui generis* rights of the database maker, before the expiration of the 15 years granted by law.

50 Fogel, K., *Producing Open Source Software*, O'Reilly Media, 2005, p. 173.

51 The Art. 8 statues that «Member States shall ensure that standard licences for the re-use of public sector documents, which can be adapted to meet particular licence applications, are available in digital format and can be processed electronically. Member States shall encourage all public sector bodies to use the standard licences». Legal openess and interoperability has become a urgent priority, as described in Ricolfi, M., et. al., *The "Licensing" of Public Sector Information*, cit., p. 129.

52 *Ivi*, p. 129.

53 Aliprandi, S., *Open licensing e banche dati*, cit., p. 29.

Following this approach, the work will immediately go into public domain. To achieve this effect, it is necessary that the holder of the *sui generis* rights releases a public statement in which he renounces to the exercise of this right in an unlimited and unconditional way. This approach will create a so-called "artificial public domain". Thus, if the maker of a database decides to waive all the copyright and the *sui generis* right to the extent permitted by law, it will remove any doubts about the legal schemas that have to be applied. This solution provides greater freedom of use and reuse of the database and creates less problems especially on an international dimension. Therefore, «certain features of public domain dedication still need testing and experimenting»[54]. This is important since when a dataset is shared on the web, an American reuser, for instance, might wonder if he or she has to comply with an European right that he or she is not familiar with. Two main legal tools endorse this model: the Creative Commons Zero (CC0)[55] and the Open Data Commons Public Dedication License (ODC-PDDL)[56]. Technically, those are not licenses, but rather a waiver and therefore do not establish a legal relationship between licensor and licensee[57]. They are «universal dedication that may be used by anyone wishing to permanently surrender the copyright and database rights they may have in a work, thereby placing it as nearly as possible into the worldwide public domain»[58]. The main difference between the two waivers is that CC0 covers various kind of intellectual of work, while ODC-PDDL was specifically created for databases and the *sui generis* right.

54 Ricolfi, M., et. al., *The "Licensing" of Public Sector Information*, cit., p. 129. The last discussion about waiving *sui generis* rights was in the context of the public consultation made by Agenzia per l'Italia Digitale, before releasing the last version of the Italian Open Data Guidelines. The final document reminds: «CC0 should be carefully used, especially if data are coming from sources that, in turn, have already defined a license». Agenzia per l'Italia Digitale, Linee guida nazionali per la valorizzazione del patrimonio informativo pubblico (anno 2014), cit., p. 81.

55 The official text of Creative Commons Zero is only written in English. Commons Deed and legal text can be found here: http://creativecommons.org/publicdomain/zero/1.0/. Many actors in the web share their data using CC0, i.e., the Autonomous Province of Trento, the Veneto Region and the Lazio Region.

56 Legal text can be found here: http://opendatacommons.org/licenses/pddl/1-0/. Cambridge University Libraries shares data using this license.

57 Aliprandi, S., *Creative Commons: a user guide*, cit., p. 128.

58 Vollmer, T., Peters, D., *Creative Commons and public sector information: flexible tools to support PSI creators and re-users*, EPSI Topic Report no. 23, 2011.

3.2. Attribution

A second way for licensing non-creative databases consists in using an attribution license. The main idea is that the only limitation to the extent of the reuser's freedom is to give appropriate credit to the database maker. The most important legal instruments are Open Data Commons Attribution (ODC-By)[59], Creative Commons Attribution (CC-By) and Italian Open Data License (IODL) 2.0[60]. ODC-By and IODL 2.0 were created specifically for databases and cover the *sui generis* right. CC-By was created for various kinds of intellectual work, and the problem has historically been about understanding if the *sui generis* right is included in the scope of the license. From a detailed reading of the legal code, it is clear that the version 3.0[61] excludes it. Moreover, open data teams and communities usually adopted the version 2.5[62] that is silent on the topic. Recently[63], the version 4.0[64] was published and it includes the *sui generis* right in the scope of the license[65].

3.3. Sharealike

The Oxford Dictionary defines "share-alike" as «hav[ing] or receiv[ing] an equal share». This concept is strictly related to the copyleft principle that had a disruptive effect on software development. Rosen paraphrased the copyleft principle as follow: «you may have this free software on condition that any derivative works that you create from it and distribute must be

59 Legal text can be found here: http://opendatacommons.org/category/odc-by/. The OCLC, a Library Consortium, uses this license.

60 Legal text can be found here: http://www.dati.gov.it/iodl/2.0/. This license is used for data shared by, i.e., Italian Ministry of Healt, Friuli Venezia Giulia Region and Municipality of Napoli.

61 Legat text and Commons Deed of the Creative Commons Attribution 3.0 license can be found here: https://creativecommons.org/licenses/by/3.0/. Enel Open Data Project, a well known open data initiative, uses this license.

62 Legat text and Commons Deed of the Creative Commons Attribution 2.5 license can be found here: https://creativecommons.org/licenses/by/2.5/. Piemonte Region uses this license for its open data.

63 Version 4.0 of Creative Commons licenses were lunched on November 25th, 2013. Details are available here: http://creativecommons.org/weblog/entry/40768.

64 Legat text and Commons Deed of the Creative Commons Attribution 2.5 license can be found here: http://creativecommons.org/licenses/by/4.0/.

65 Details about the improvements made in the version 4.0 are available here: http://creativecommons.org/version4

licensed to all under the same license»[66]. The share-alike clause ensures that the freedom granted by the first author is also maintained on derived works by all the reusers. This effect is also called "viral effect", since the presence of a copyleft-licensed work in the context of a derivative work made by different open licensed works makes the final work licensed under the first copyleft license. The most famous license including this clause is the GPL (General Purpose License) that «has been enormously influential in creating a large public commons of software that is freely available to everyone worldwide»[67]. The share-alike clause «prevents much software from being captured by proprietary software interests and converted into restrictive private property for personal gain»[68].
This philosophy was transferred from the software domain to many other contexts. In the open data licensing landscape, the most important share-alike licenses are Creative Commons Attribution Sharealike (CC By-Sa)[69], Italian Open Data License (IODL) 1.0[70] and Open Data Commons Open Database License (ODC-ODbL)[71]. Even if this philosophy «has greatly contributed to the expansion of the digital commons»[72], several European recommendations[73] refrain from the usage of copyleft licenses.

4. Semantic Tools for License Expression: the Story so Far

Going through the open data catalogue all around the web, it is clear that data are shared in a raw and unstructured way. New technologies are slowly growing according to the linked data and the semantic web

66 Rosen, L., *Open source licensing*, Prentice Hall, 2005, p. 103.
67 *Ivi*, p. 109.
68 *Ibidem.*
69 Legat text and Commons Deed of the Creative Commons Attribution Share-Alike 2.5 can be found here: http://creativecommons.org/licenses/by-sa/2.5/. Constitutional Court and Province of Prato apply this license to their datasets.
70 Legal text can be found here: http://www.formez.it/iodl/. Italian Ministry of Healt and the Autorità di Bacino del Fiume Arno apply this license to their datasets.
71 Legal text can be found here: http://opendatacommons.org/licenses/odbl/. The main project that applies this license to its datasets is OpenStreetMaps.
72 Ricolfi, M., et. al., *The "Licensing" of Public Sector Information*, cit., p. 138.
73 The most important one is De Rosnay, M., Tsiavos, P., Artusio, C., Elli, J., Ricolfi, M., Sappa, C., Vollmer, T., Tarkowski, A., *Licensing Guidelines*, LAPSI 2.0 Thematic Network, 2014. There are other class of licenses, like the non-commercial or the non-derivative. The same document refrain from using non commercial clause and licenses prohibiting the creation of derivative works.

paradigms[74]. Following Tim Berners Lee, father and main supporter of this innovation, the semantic web is an extension of the current web, where «information is given well-defined meaning, better enabling computers and people to work in cooperation»[75]. The main challenge is to «provide a language that expresses both data and rules for reasoning about the data»[76]. In this context, technology redefines the relationship between humans and information like never before[77]. Semantics has the power of giving order in the categorization of data, defining rules and relations between datasets. At the same level, technology has a central role in law enforcement: technical standards affect the behaviour in the digital space[78] and «this change is throwing up new issues regarding rights protection, copyright and the need to understand the technological issues involved»[79]. In this technological environment, the main regulatory tools are not laws, but the architectures implemented through the mean of code[80]. For example, a computer system can be designed to prohibit access to those who are not provided with a password, or deny the modification of a read-only file. These tools are mainly used for two purposes: "privacy by design"[81] implementations and copyright rules expression.
My analysis will focus on the second aspect, related to the expression, the management and the enforcement of copyright rules. The main idea is that the «Internet is changing the distribution of digital media from a passive one way flow (from publisher to the end user) to a much more interactive cycle where creations are reused, combined and extended *ad infinitum*. At all stages, the rights need to be managed and honoured with trusted

74 Bizer, C., Heat, T., Berners-Lee, T., *Linked data – the story so far*, in Heath, T., Hepp, M., Bizer, C., (eds.), *Special Issue on Linked Data, International Journal on Semantic Web and Information Systems* (IJSWIS).

75 Berners-Lee, T., Hendler, J., Lassila, O., *The semantic web*, Scientic American, 2001, 5, p. 34.

76 *Ibidem.*

77 Moscon, V., *Rappresentazione informatica dei diritti e diffusione della conoscenza*, in Caso, R., (eds.), *Accesso aperto alla conoscenza scientifica e sistema trentino della ricerca: atti del Convegno tenuto presso la Facoltà di Giurisprudenza di Trento il 5 maggio 2009, Trento, Università degli Studi di Trento*, 2010, p. 149.

78 This ideas come from the intuitions written in Lessig, L., *Code 2.0*, Basic Books, 2006.

79 Barlas, C., *Digital Rights Expression Languages*, JISC Technology and Standard Watch, July 2006. Available at: http://www.jisc.ac.uk/media/documents/techwatch/tsw0603.pdf.

80 Moscon, V., *Rappresentazione informatica dei diritti,* cit., p. 149.

81 Cavoukian, A., *Privacy by design*, Information & Privacy Commissioner, Ontario, Canada. Available at: http://www.privacybydesign.ca/.

services»[82]. In this specific context, licenses became metadata[83] and travel on the web strictly bounded to the data itself. This technical layer for law enforcement techniques is called Digital Right Management (DRM)[84] and it uses Right Expression Language (REL) to express policies about digital content it refers to. A right expression language is «a type of high-level computer processable language that can express human instructions for interpretation, without ambiguity and in a secure manner, by a processing service»[85]. Note that REL is «not a way for expressing copyright law, that do not have anything to do with enconding copyright, nor do they have any legal force *per se*»[86]. RELs encode contracts in the form of permissions and obligations, being a kind of «encoded contract»[87]. From the technical perspective, RELs are formalized in XML[88], «which can be read by human beings […] as well as computers»[89]. Moreover, RELs are based on DRM techniques that are able to activate rules and licenses, keeping separated policies from enforcement mechanisms. Obviously, there are many limitations related to the conceptualization and to the modelling of complex

82 Iannella, R., *Open Digital Rights Management*, Workshop on Digital Rights Management for the Web, Sophia-Antipolis, France. Available at: http://www.w3.org/2000/12/drm-ws/pp/iprsystems-iannella.html.

83 This is a broad definition of metadata: «Metadata describes other data. It provides information about a certain item's content. For example, an image may include metadata that describes how large the picture is, the color depth, the image resolution, when the image was created, and other data. A text document's metadata may contain information about how long the document is, who the author is, when the document was written, and a short summary of the document». TechTerms (http://www.techterms.com/definition/metadata).

84 The most important legal novelty came from the WIPO Treaties (WIPO Copyright Treaty and WIPO Performance and Phonograms Treaty). Then, many legal systems all over the world endosed a broad definition and protection of DRM techniques. In Europe, this innovation came through the Directive 2001/29/CE. For further information, see: Caso, R., *Forme di controllo delle informazioni digitali: il digital rights management*, in Caso, R., (Ed.), *Digital rights management: problemi teorici e prospettive applicative: atti del convegno*, Università di Trento, Trento, 2007, p. 5.

85 Barlas, C., *Digital Rights Expression Languages*, cit., p. 7.

86 *Ibidem*.

87 *Ibidem*.

88 Extensible Markup Language (XML) is a flexible text format, originally designed to meet the challenges of large-scale electronic publishing, XML is also playing an increasingly important role in the exchange of a wide variety of data on the Web and elsewhere. It aids to interoperability and interworking. For further information about XML see http://www.w3.org/XML/.

89 Barlas, C., *Digital Rights Expression Languages*, cit., p. 7.

legal concepts[90]. On the other hand, RELs and DRMs aim at preventing unauthorized use of digital contents only as part of a secure computing environment, that is surely not as open as the web itself. One way is to create a "trusted computer network"[91]. The other one is to develope a "closed" application environment.

Many types of RELs were developed according to different application and context, but all of them share the same conceptual structure. Generally speaking, Resources, Agents and Rights are the three main nodes of a REL in our copyright scenario. The basic scenario enables Agent A to grant Right B to Agent C to use Resource D under certain specific Condition/Constraint/Requirement E. Resources represent digital artefacts or services that have to be licensed. Rights refer to access permissions or allowed usage of Resources. Every single right expression language has its own formalization of rights, but all of them have four main categories of rights: Manage, Reuse, Transfer and Use[92]. The Rights node is the core of every REL and can be personalized also for defining limitations in time and space, i.e., user identification, user right expression based on his role in the specific digital environment, royalties required for the use of the work, single permissions, etc. Finally, Agents are individuals that are going to have a relation with a digital goods.

Translating licenses in REL means formulating instructions into a machine-readable formats, and has the power to reduce ambiguity and costs for the parties involved. Moreover, it gives the power to the system to reason about license that has to be applied on a derivative work or a mashup[93] down-streaming from two different works with different up-streaming licenses[94].

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90 For further information, see: Biagioli, C., Tiscornia, D., Mariani, P., *Esplex: A rule and conceptual model for representing statutes*, in *ICAIL '87 Proceedings of the 1st international conference on Artificial intelligence and law*, ACM, New York, 1987, p. 240.

91 Many insight on the topic can be found in Caso, R., *Un "rapporto di minoranza": elogio dell'insicurezza informatica e della fallibilità del diritto. Note a margine del Trusted Computing*, in Caso, R., (eds.) *Sicurezza informatica: regole e prassi: atti del Convegno*, Università di Trento, Trento, 2006, p. 5.

92 Moscon, V., *Rappresentazione informatica dei diritti,* cit., p. 150.

93 Mashups are the new hybrids of interactive applications that are created from combining the various service components and data sources to provide new value or adding value in some way. Gangadharan, G. R., Weiss, M., D'Andrea, V., Iannella, R., *Exploring the Intellectual Rights in a Mashup Ecosystem*, 6th International Workshop for Technical, Economic and Legal Aspects of Business Models for Virtual Goods incorporating the 4th International ODRL Workshop, 2008, Poznan, Poland.

94 Some tools are yet available on the web. For example TLDRLegal aims at helping the

Coming back to the open data landscape, it is clear that the value of data maximally increases with their reuse if data are mixed in mashups. Keeping track of the original author and his policies on the reuse of that specific dataset will surely increase trust through a better honoring of digital rights. The final result is a new kind of digital ownership[95] on open data generated in smart environment[96].

4.1. Preliminary State of the Art in Rights Expression Languages

The most frequently used RELs are XrML, ODRL and ccREL. XrML[97] is based on MPEG21, that is a suite of standards tools for managing digital resources. It includes a Right Expression Language and a Rights Data Dictionary, formalizing semantics and lexicon respectively. XrML aims at formalizing licenses in a machine-actionable way, to interact with software and hardware trusted platform. It was developed by ContentGuard and it is now an ISO standard[98].

ODRL (Open Digital Rights Language) is a «proposed language for the Digital Rights Management (DRM) community for the standardisation of expressing rights information over content»[99]. The main idea is that other DRM technologies include RELs in closed architectures for the overall management of rights. ODRL provides the semantics for DRM expressions «in open and trusted environments whilst being agnostic to mechanisms to achieve the secure architectures»[100].

Finally, ccREL (Creative Commons Rights Expression Language) is «the standard recommended by Creative Commons for machine-readable expression of copyright licensing terms and related information»[101]. The most important aspect is that there is not a DRM technology associated to

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user in choosing a correct license through comparison: https://tldrlegal.com/compare.

95 Many of these aspects were proposed in Lessig, L., *Code 2.0*, cit., p. 73.

96 De Lange, M., De Waal, M., *Ownership in the hybrid city*, Virtueel platform research, 2012, available at: http://www.socialcitiesoftomorrow.nl/wp-content/uploads/2012/02/Ownership_EN.pdf.

97 More technical details can be found here: http://xml.coverpages.org/xrml.html.

98 Guo, H., *Digital rights management DRM using XrML*, T-110.501, Seminar on Network Security, 2001.

99 More information on the project can be found here: http://www.w3.org/TR/2002/NOTE-odrl-20020919/

100 Iannella, R., *Open Digital Rights Management*, cit.

101 Abelson, H., Adida, B., Linksvayer, M., Yergler, N., *ccREL: The Creative Commons Rights Expression Language*, W3C Member Submission, 2008. Available at: http://www.w3.org/Submission/ccREL/.

it. Moreover, all the Creative Commons Licenses do not allow the licensor to enforce the license with a DRM, giving to the reuser also the possibility to violate the license.

5. Concluding remarks

This paper aims at providing an overview of the main legal instruments for open data licensing and it bases on the assumption that licenses have to be enforced by technology into architectures for honoring authors rights. Consequently, licenses have to travel strictly bound with data they refer to. Right Expression Languages (RELs) are the means through which legal requirements are expressed and embedded into technological systems. The main result will be an increasing trust in the ICT infrastructural world. This is a first insight of a more general problem[102] that is growing in our everyday life and that I am trying to investigate in my research activity. My main questions are: how to respect rights in the digital environment? How to "not reinvent the wheel", and build a trustworthy and "*compliance-by-design"* layer in the semantic web environment ensuring the honoring of individual rights? Finally, how can I define a common semantic for describing rights in the digital environment? If all DRM systems were «able to recognize a single rights language then it would be possible for content owners to set a single, universally understood set of rights and permissions to a content object, safe in the knowledge that DRM systems would be able to handle it»[103].
The aim of my research is a new approach to the design of smart cities applications, where data coming from citizen's sensors are linked to government databases. My idea is about redefining ownership of data and digital identity, «without digitalizing the existent»[104], deeply understanding

102 The problem should be splitted in two main questions: how to make the architecture compliance to law requirements «by design»? How to balance different rights in the digital environment? These questions took new energies after the European's Court decision about the «right to be forgotten» in Google's systems. Google Spain SL, Google Inc. v Agencia Española de Protección de Datos, C-131/12, ECLI:EU:C:2014:317. For furter information, see: Travis, A., Arthur, C., *EU court backs "right to be forgotten": Google must amend results on request*, The Guardian, 13.05 (2014). Available at: http://www.theguardian.com/technology/2014/may/13/right-to-be-forgotten-eu-court-google-search-results.

103 Barlas, C., *Digital Rights Expression Languages*, cit., p. 14.

104 Vianello, M., Smart cities – gestire la complessità urbana nell'era di Internet, Maggioli, Rimini, 2013, p. 72. A short summary is available at: http://www.slideshare.net/michelevianello/una-scommessa-da-vincere.

the phenomenon and rethinking solutions in a smart environment. Taking inspiration from the OnLife Manifesto[105], the final purpose is to let cities become smarter also from a compliancy and a legal point of view. I believe that honoring citizen's rights in the digital landscape is the key issue for fostering innovation and creativity. As shown in this paper, my research questions are related to complex social issues and they require a new approach to address problems since many disciplines came out from this perspective. For these reasons, my research will be guided by a transdisciplinary approach[106], moving «across the disciplines, between the disciplines and beyond and outside all disciplines»[107]

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