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Software, copyright and the learning environment: an analysis of the IT contracts Swedish schools impose on their students and the implications for FOSS

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Abstract
Free and open source software (FOSS) is commonly made available to students in schools, but the schools do not necessarily take a holistic approach to their provision of IT (including software) which takes into account the nature of FOSS. In particular, we have identified a number of contracts with which Swedish students who are provided with laptops by their schools are required to comply which set out conditions for the use of the laptops, and associated software and content. Many clauses in these contracts are legally incompatible with certain FOSS licences, or contain misconceptions about FOSS, licensing and culture. This paper explores the relationship between the contracts and FOSS licensing and culture, and suggests a number of resolutions to the contradictions and misconceptions, as well as considering related issues.

Keywords
Law; information technology; Free and Open Source Software; schools and education; further restrictions; GPL; Sweden

1. Introduction

In recent years public sector schools have been exposed to and adapted to a number of societal and technological changes which impact on educational practices. One such change concerns adoption of IT, including a variety of different types of software and services, in educational activities in schools.

The use of IT (including software) in schools has received significant attention in many countries in a desire to gain positive pedagogical effects and prepare students for society and working life.[1]

1 Balanskat, A., Blamire, R., Kefala, S. (2006) The ICT Impact Report: A review of studies of ICT impact on schools in Europe, European Schoolnet, 11 Dec.; Fleischer, H. (2012) What is our current understanding of one-to-one computer

Research shows that several public sector schools in different countries seek to achieve such pedagogical effects by provision of laptops and software to individual students, including compulsory schools (broadly ages 7-16) and upper secondary schools (broadly ages 16-19) in Sweden.[2]

There is previous research addressing use of Free and Open Source Software (FOSS[3]) at university[4] and high school levels,[5] and some research on provision of software under different licences in school contexts. For example, González-Martínez et al.[6] presents a review of the use of cloud computing ('Software as a service' or 'SaaS') in schools. However, there is a lack of research on legal conditions for provision of FOSS to students in schools. With provision of FOSS in such a scenario, students, schools and municipalities are exposed to a number of regulations and rules related to the use of software and services and it is common that students and guardians are required to comply with conditions in contracts presented by the school. Many of these conditions are difficult to interpret.[7]

Exposure to and involvement in FOSS culture may make a significant contribution to skills development both in educational contexts but also more broadly. For example, previous research[8] which involved data collection from "Swedish practitioners within companies known to be active users" of FOSS stressed active involvement in FOSS projects as a promoter of change with significant opportunities for learning. In fact, the study[9] identified "skills development as an important outcome of participating", and several practitioners "also elaborated their experiences of being able to influence and expressed a sense of fun."

In a broader study aimed to establish the state of practice concerning IT usage in Swedish public sector schools with students of school age in Sweden (which starts in the year they turn 7 and ends

projects: A systematic narrative research review, Educational Research Review, Vol. 7, pp. 107-122. http://dx.doi.org/10.1016/j.edurev.2011.11.004; de Macedo Guimarães, L. B., Duarte Ribeiro, J. L., Echeveste, M. E. and de Jacques, J. J. (2013) A study of the use of the laptop XO in Brazilian pilot schools, Computers & Education, Vol. 69, pp. 263-273.; IES (2010) Teachers' Use of Educational technology in U.S. Public Schools: 2009, National Center for Education Statistics, NCES 2010-040, U.S. Department of Education, Washington, May.; Livingstone, S. (2012) Critical reflections on the benefits of ICT in education, Oxford Review of Education, Vol. 38(1), pp. 9-24. http://dx.doi.org/10.1080/03054985.2011.577938; Öman, A. and Svensson, L. (2015) Similar products different processes: Exploring the orchestration of digital resources in a primary school project, Computers & Education, Vol. 81, pp. 247-258. http://dx.doi.org/10.1016/j.compedu.2014.10.011

2 Hatakka, M., Andersson, A. and Gronlund, Å. (2013) Students' use of one to one laptops: a capability approach analysis, Information Technology & People, Vol. 26(1), pp. 94-112. http://dx.doi.org/10.1108/09593841311307169

3 See section 4 for more information about what constitutes 'FOSS'.

4 German, D. (2005) Experiences teaching a graduate course in Open Source Software Engineering, In Scotto, M. and Succi, G. (Eds.) Proceedings of the First International Conference on Open Source Systems, Genova, Italy, 11-15 Jul., pp. 326-328.; Kilamo, T. (2010) The Community Game: Learning Open Source Development Through Participatory Exercise, In Proceedings of the 14th International Academic MindTrek Conference: Envisioning Future Media Environments (MindTrek'10), Tampere, Finland, October 2010, ACM Press, pp. 55-60. http://dx.doi.org/10.1145/1930488.1930500; Lundell, B., Persson, A. and Lings, B. (2007) Learning Through Practical Involvement in the OSS Ecosystem: Experiences from a Masters Assignment. In Feller, J. et al. (Eds.), Open Source Development, Adoption and Innovation, Springer, Berlin, ISBN 978-0-387-72485-0, pp. 289-294. http://dx.doi.org/10.1007/978-0-387-72486-7_30

5 Lin, Y.-W. and Zini, E. (2008) Free/libre open source software implementations in schools: Evidence from the field and implications for the future, Computers & Education, Vol. 50(3), 1092-1102. http://dx.doi.org/10.1016/j.compedu.2006.11.001

6 González-Martínez, J. A., Bote-Lorenzo, M. L., Gómez-Sánchez, E. and Cano-Parra, R. (2015) Cloud computing and education: A state-of-the-art survey, Computers & Education, Vol. 80, pp. 132-151. http://dx.doi.org/10.1016/j.compedu.2014.08.017

7 Under Swedish law, the students, if they are under the age of 18, cannot be legally bound to the agreements. Breach of them is likely to be regarded as a breach of school rules rather than a legal matter. This does have some impact on 'further restrictions' which are outlawed by GPLv2 and GPLv3 licences – see below. In some cases, parents or guardians are required to sign, in which case, the contracts would be legally binding on those parents or guardians (assuming they themselves are adults).

8 Lundell, B., Lings, B. and Lindqvist, E. (2010) Open source in Swedish companies: where are we?, Information Systems Journal, Vol. 20(6), pp. 519-535. http://dx.doi.org/10.1111/j.1365-2575.2010.00348.x

9 Lundell et al. (2010) ibid., at page 529.

in the year in which they turn 19), an extensive data collection exercise was undertaken. The exercise included questions and requests for public documents from all public sector schools through data collection via each of the 290 municipalities in Sweden. As a number of schools and municipalities did not provide requested information, data collection continued with a long-term systematic effort to identify information about IT usage in schools. Information obtained included details on provision of software (including FOSS) and contracts related to IT usage in schools.

As part of the broader study, this paper presents new results on inconsistencies between FOSS licences and contracts applicable to students in Swedish schools governing their use of school IT ('school contracts'). Further, and in so doing, we highlight misconceptions concerning copyright. Specifically, results presented concern: a characterisation of FOSS licenses used in Swedish schools; a critical review of inconsistencies between FOSS licenses and school contracts; and an elaboration on implications and resolution of inconsistencies between FOSS licenses and school contracts, with an elaboration on misconceptions concerning copyright.

There are two main goals in the paper. First, we identify and characterise inconsistencies between the licenses applicable to FOSS provided in Swedish schools and the contracts to which students of those schools are required to adhere in order to use school-provided laptops. Second, we explain the legal implications of, and suggest a resolution of, identified inconsistencies. In so doing, we report on certain misconceptions some of which may contribute to and explain identified inconsistencies.

There are four research questions:

RQ1: Given that certain FOSS applications are provided to students in Swedish schools, which FOSS licenses apply to that provision and what characterises those FOSS licenses?

RQ2: Given that Swedish students' use of school laptops is governed by contracts issued by their school, to the extent that the terms of those contracts are inconsistent with the FOSS licenses applicable to FOSS applications identified as being provided in schools, what characterises these inconsistencies?

RQ3: Given that Swedish students' use of school laptops is governed by contracts issued by their school, to the extent that the terms of those contracts are inconsistent with the FOSS licenses applicable to FOSS applications provided in schools, what are the legal implications of identified inconsistencies and how can those inconsistencies be resolved?

RQ4: Given that Swedish students' use of school laptops is governed by contracts issued by their school, what misconceptions do those contracts contain about the effect of copyright and licensing both in relation to software and digital assets?

The rest of this paper is organised as follows. First, we provide a background on Swedish schools and provision of FOSS (2) followed by our research approach (3). Thereafter we characterise FOSS licenses used in Swedish schools (4), and characterise inconsistencies between FOSS licenses and school contracts (5). We report on implications and resolution of legal inconsistencies between FOSS licenses and school contracts (6) and elaborate on misconceptions concerning copyright, identifying, in addition, some related misconceptions concerning FOSS (7). Finally, we present our analysis (8), followed by discussion and conclusion (9).

2. Background

Research conducted in the Swedish public sector context notes[10] that "Swedish schools have a relatively long history of computer use in schools and in recent years the IT focus has grown even

10 Hatakka, M., Andersson, A. and Gronlund, Å. (2013) Students' use of one to one laptops: a capability approach analysis, Information Technology & People, Vol. 26(1), pp. 94-112. http://dx.doi.org/10.1108/09593841311307169

stronger." It shows that besides pedagogical motivations there are also other reasons for why 1:1 laptops are provided to students in Swedish schools, one being the democratic perspective.[11]

It has been found that provision of laptops and associated software may lead to undesired dependency on specific (proprietary) technology. Previous research from Swedish schools found[12] that the use of 1:1 laptops in primary schools identified negative outcomes for some students and with the introduction of 1:1 laptops in school previous research identified that in "many cases the students also lost the choice not to use the laptop". Hence, students may implicitly become "locked-in" to the use of laptops and the software provided to them.

Openness and transparency have been recurring themes in communication and public speeches from representatives for the Swedish government for a number of years. For example, in its 2004 IT bill (2004/05:175), the Swedish government declared that the use of Open Standards and OSS should be promoted.[13] Further, in a public speech during the Swedish EU presidency, the responsible minister presented the Swedish position on the importance of openness in the public sector and in so doing stressed the importance of open source and open standards.[14]

In the Swedish context, it should be noted that students in an educational context cannot be expected or required to buy (or pay to rent) specific technology when studying in Swedish public schools. In fact, the Swedish Schools' Inspectorate[15] examines an important principle for education in Sweden, namely that "education shall be free of charge", and clarifies that the cost of calculators used in public sector schools and costs related to use and insurance of laptops provided to students for use at school and at home cannot be charged for. However, a small fee (approx. €10) can be accepted on an occasional basis, such as for costs related to a school trip involving outdoor activities.

Previous research in the Swedish school context identified[16] that "Education is also a goldmine for hardware and software manufacturers who compete with each other to generate sales of their products." Further, it was noted[17] that "Because schools' investment in computers is so massive, it is easy to understand why Apple, Dell, HP and others compete in order to win contracts with schools."

It has been shown[18] that students' use of laptops and software is regulated by "softer measures such as rules and contracts between the school, the students, and the parents/guardians."

Before software and services provided by external suppliers are adopted for use in public sector organisations, such as schools, it is recommended that a risk assessment is undertaken. Such an assessment needs to take into account potential impacts on both the acquiring organisation and also on individuals affected by software and services used in the organisation. To support such an assessment, specific guidelines have been established for use by Swedish public sector organisations.[19] These guidelines stress the importance of reviewing contracts and conditions for

11 Hatakka et al. (2013) ibid.
12 Hatakka et al. (2013) ibid., at page 108.
13 Regeringskansliet (2005) From an IT policy for society to a policy for the information society: Summary of the Swedish Government Bill 2004/05:175, Ministry of Industry, Employment and Communications, Sweden, Regeringskansliet, September.
14 Odell, M. (2009) Innovations for Europe: Increasing Public Value, Public Speech at: 'European Public Sector Award', Maastricht, 5 Nov.
15 Skolinspektionen (2011) Avgifter i skolan, Informationsblad, Skolinspektionen, 7 Dec., http://www.skolinspektionen.se/Documents/vagledning/infoblad-avgifter.pdf
16 Fleischer, H. (2012) ibid., at page 120.
17 Fleischer, H. (2012) ibid., at page 120.
18 See page 45 in: Andersson, A., Hatakka, M., Grönlund, Å and Wiklund, M. (2014) Reclaiming the students - coping with social media in 1:1 schools, Learning, Media and Technology, Vol. 39(1), pp. 37-52. http://dx.doi.org/10.1080/17439884.2012.756518
19 See page 20 in: E-delegationen (2010) Myndigheters användning av sociala medier, Riktlinjer från E-delegationen, Version 1.0, 30 December (in Swedish), http://www.edelegationen.se/Documents/Vagledningar%20mm/Riktlinjer_sociala_medier_v1_0.pdf

use of services provided by external suppliers before their use in a public sector organisation. In a public sector school context, this review must consider the perspective of its users, and thereby include assessment of conditions for teachers and students. Such risk assessment of contracts is particularly important for Swedish governmental agencies and public sector schools in situations when these organisations use social media and services provided by external suppliers which are based outside the EU.[20]

3. Research approach

To address the goals in this paper, a set of contracts used in Swedish public sector schools was obtained together with associated information concerning provision of software (including, in some cases, SaaS). The contracts and information were collected as part of the broader study: collected data from the broader study of relevance for this paper includes details on provision of software (including FOSS) and contracts related to IT usage in schools.

Contracts were identified and collected from the broader study in order to identify potential issues that may arise in deployment of FOSS in municipalities which provide laptops to students. Initial analysis of collected contracts identified which signatories are required. Almost all schools require that both students and their guardian(s) sign the contract (which may be unsurprising given that students younger than 18 cannot be legally bound by contracts under Swedish law.[21] The study also considers contracts which either only the student or the guardian(s) needed to sign. Some schools use contracts which two guardians are required to sign.[22]

School contracts used in municipalities (including both those municipalities that provide and do not provide FOSS) were initially interpreted holistically in order to obtain an initial impression of potential issues. This was done with a view to identifying a relevant approach for analysis of statements and contract terms.

Several approaches for coding and analysis were considered, leading to the emergence of the four freedoms as an appropriate framework for categorisation of statements in the contracts. The 'four freedoms' define what constitutes a free software licence according to the Free Software Foundation.[23] Contract statements were filtered and coded accordingly. As the coding progressed, supplementary categories were introduced to cover issues concerning perceptions of copyright in contract statements, with a view to disclosing potential misconceptions and attitudes relating to copyright (whether more or less supportive of FOSS culture). Specific statements in contracts were reviewed and validated from a legal perspective, at which point it became clear that there is a mapping amongst the four freedoms, and the exclusive economic rights reserved to copyright owners by the Computer Programs Directive[24] (and, in the case of other digital assets, by the Copyright Directive[25]).

The scope of FOSS licences reviewed was determined by reference to the FOSS applications that were identified as being provided in schools as established in the broader study.

4. Characterisation of FOSS licenses used in Swedish schools

So-called 'free' software licences are licences which provide the recipient of code[26] licensed under

20 SOU (2010) Så enkelt som möjligt för så många som möjligt: Under konstruktion – framtidens e-förvaltning, Betänkande från E-delegationen, Statens Offentliga Utredningar, SOU 2010:62, Stockholm, ISBN 978-91-38-23440-2.
21 See footnote 7 above.
22 It is not clear what is supposed to happen if a student only has one guardian.
23 See below for a brief introduction to the genesis of the four freedoms.
24 Computer Programs directive 2009/24/EC
25 Copyright Directive 2001/29/EC
26 'Code', meaning software code, is traditionally divided into source code and object code. The source code is the

them with unrestricted rights under the four freedoms mentioned above. They are freedoms to (0[27]) use the software, (1) study and modify the software, (2) distribute the software and (3) distribute modifications to third parties. 'Open source' software licences provide similar rights to recipients of open source software, as defined by ten criteria (the 'Open Source definition') published by the Open Source Initiative[28] (OSI). With few exceptions (not relevant to this paper), software released under a Free Software Licence will also meet the OSI criteria, and vice versa, hence the term FOSS ('Free and Open Source Software').

FOSS differs significantly from proprietary software (sometimes mistakenly called 'commercial software') in that its licence terms emphasise freedoms rather than restrictions. The preamble to a common FOSS licence (the GNU General Public License (v3)) states:

> *The licenses for most software and other practical works are designed to take away your freedom to share and change the works. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change all versions of a program – to make sure it remains free software for all its users. We, the Free Software Foundation, use the GNU General Public License for most of our software; it applies also to any other work released this way by its authors. You can apply it to your programs, too.*

Someone who receives software licensed to them under a FOSS licence is, by that licence, granted the right to exercise the four freedoms. If they distribute[29] the software to a third party, they may or must (depending on the original licence) also grant that third party the right to exercise the four freedoms in respect of that software.

Hence, FOSS licences may be placed into two broad categories: copyleft,[30] sometimes called 'reciprocal' or 'sharealike',[31] which requires an onward recipient to receive the software under a licence preserving the four freedoms, and permissive, sometimes called 'academic', which allows the software to be passed on under a different, possibly non-FOSS, licence.[32]

Where FOSS is made available under a copyleft licence, if it is distributed, it is a condition of the copyleft licence that the distributed code must be distributed under the same (or, in some cases, a specified compatible) licence. If FOSS is made available under a permissive licence, there is no such obligation, and the FOSS may be redistributed under any licence (albeit that there may be some requirements involving the retention of attribution notices and disclaimers).

human-readable text in which software is written, modified and debugged. In a compiled computer language (like C++), the source code is converted (on the programmer's computer) into the software the computer can run – the object code – using a suite of software called a toolchain, a significant component of which is the compiler. Some computer languages (such as Python and JavaScript) are 'interpreted' meaning that the source code can be run directly on the end-user's computer without being compiled, provided that there is an appropriate interpreter installed on that computer (almost all web browsers will have a javascript interpreter installed, for example). 'Executable' means the code which can run on the computer – which may be object code or source code depending on the language. The distinction between source and object is significant in terms of FOSS licensing because many licences make the distinction (and were drafted before interpreted languages became common, which in itself creates a raft of issues outside the scope of this paper).

27 As an organisation founded by a computer software engineer, the Free Software Foundation favours starting the list with zero.

28 Open Source Initiative: http://opensource.org/osd-annotated

29 The word 'distribute' has a specific meaning in copyright law. This is discussed below.

30 Copyleft is a play on the word 'copyright' and is a mechanism, dependent on copyright law to work, which makes it a condition of a copyright licence for the licensee, on distributing copyleft software or any modifications to it, to make the source code to the software and modifications available under the same licence.

31 Or 'viral' or 'cancerous'

32 The openness of software is dependent on the licence, not on the code. Thus a person can receive the Apache Web Server under the Apache 2.0 License (which is a permissive licence), as FOSS, and (because the Apache licence allows this) pass exactly the same code on to a third party under a different, non-FOSS licence. In the hands of the final recipient, the software is not FOSS, even though it's exactly the same code which was received under a FOSS licence. Copyleft licences are designed to prevent this from happening.

Where a school distributes[33] FOSS to students and that software is governed by a copyleft licence, the school will only be compliant with that copyleft licence where it redistributes the FOSS to students under the same (or a compatible) licence. The consequence of this is that the licence received by the students for copyleft FOSS will be a licence which guarantees the four freedoms. At the same time, students are required to enter into an agreement[34] with the school which requires them to comply with certain obligations relating to computing in general, but also concerning the laptops with which the school provides them, and the software which is, and may be, installed on the laptops. (Further, some municipalities provide access to applications on a SaaS basis. This would require the student to enter into a further agreement with the SaaS provider. Analysis of such contracts is generally beyond the scope of this paper, although we make some observations in section 8).

Those contracts may (possibly as an unintended consequence) have the effect of limiting the scope of the FOSS licences under which the students have received the software. This is an issue which potentially affects all software which is made available under copyleft FOSS licences. However, some licences, notably the various versions of the GNU General Public License (GPL), for example (GPLv3) and GNU Lesser General Public License (LGPL) contain wording specifically preventing the imposition of further restrictions:

> *You may not impose any further restrictions on the exercise of the rights granted or affirmed under this License*[35].

The effect of this is two-fold. A recipient of GPL code will be licensed to use, modify and distribute that code under the GPL without being bound by any further restrictions[36], and the school, where it distributes GPL code in a way which attempts to impose additional restrictions, will itself be in breach of the GPL in respect of that code. Consequently, it would lose its own licence to use that code (subject to specific cure provisions in GPLv3[37]).

The issues arising from the attempted imposition of further restrictions on the FOSS licence do not arise with FOSS licensed under permissive licences. The extent to which they apply to other licences provided under copyleft licences other than the GPL depends on a careful reading of the individual licences, and even then is a matter of debate which is outside the scope of this paper.

We have established that FOSS is provided to students by the schools under a number of licences including the following[38]:

- GPLv2 (or any later version)
- GPLv3
- GPLv3 (or any later version)
- Mozilla Public License v2 (MPLv2)
- Apache v2
- Eclipse Public License v1 (EPLv1)
- LGPLv2.1

33 'distribute' is a term of art in copyright law, and its significance is covered below

34 There are three different mechanisms varying from school to school: sometimes the student signs, sometimes the guardian signs, and sometimes both. If the student is under 18 years, there is a question (not investigated in this paper) under Swedish law of the enforceability of the contract.

35 GPLv3, section 10 (part)

36 See GPLv3 section 7, para 4. This is not explicitly stated in GPLv2, but is implied.

37 GPLv3, section 8

38 The licences listed are those applicable to the software reported to be used at the time the data was collected. Some projects may have relicensed in the interim and we have no data about whether the schools are using the relicensed versions.

- LGPLv2.1 (or any later version)
- LGPLv3
- LGPLv2.1 with UNRAR exception

Those with a copyleft effect which would grant the students the unrestricted right to use, study, modify and redistribute the code received under it, including a right to receive the source code are:

- GPL (all versions)
- LGPL (all versions)

Those without a copyleft effect so far as distribution of unamended object code is concerned (and which therefore do not give rise to any direct issues of compatibility between the licence and the school contract[39]) are:

- Apache v2
- Mozilla Public License v2 (MPLv2)[40]
- Eclipse Public License v1 (EPLv1)[41]

5. Characterization of conflicts between school contracts and FOSS licences

In addition to the legal concerns arising from an incompatibility between the FOSS licence and the contract, there remains the issue that many of the contracts reveal a degree of incompatibility in philosophy: where the students are provided with FOSS is it clear that the software's authors intended that the software was to be made available in a way which respected the FOSS freedoms, whereas, many of the terms in the contracts attempt to impose restrictions which conflict with that intention.

5.1. On inconsistencies with FOSS Culture

A number of well known applications are available under FOSS licences, and are associated with the free and open source movements. It would therefore be reasonable for students receiving such applications on their school laptops to assume that they may be able to exercise the four freedoms in respect of them.

A number of school contracts contain clauses which have the effect of limiting one or more of the four freedoms. Irrespective of whether those clauses cause legal issues in relation to the original FOSS licence (which we consider below), they do, at the very least, conflict with the culture of FOSS.

It is no accident that the concept of 'free software' was born in an academic environment. It has

39 That is not to say that the school may not otherwise be in breach of licence terms: for example, by failing to provide the appropriate notices and attribution required by the licence (such as the NOTICE file required to be provided with distributions of Apache software). This issue is outside the scope of this paper. We further assume that the school is not amending the software prior to distribution – for example, it is distributing the installation package or the installed executables of Firefox as provided by Mozilla.

40 Mozilla Public License v2 falls within a subset of copyleft licences which treat source code and object code differently: source code files are subject to full copyleft, and if distributed, must be distributed under MPLv2 (or, in some cases, another copyleft licence). The executable object code files, however, may be distributed under any licence and use may therefore be restricted. Anyone receiving the object code is entitled to receive a copy of the source (which must be under the original MPLv2 or, optionally, a similar compatible licence).

41 Eclipse Public License v1 is similar to MPLv2 in that the object code may be relicensed under a different licence, but the corresponding source must be made available under the original EPLv1.

been well-reported[42] that Richard Stallman, the founder of the Free Software Foundation and the GNU project, developed his ideas of 'free software' while at MIT. The catalyst was the frustration arising from his inability to hack[43] a printer's driver software owing to the refusal by its supplier to provide the source code of that software. He had hacked similar software many times before: in those cases, the source code had always been available. In academia, there was an assumption that code would always be available to enable anyone to review, modify and share. It was an unwelcome revelation to Stallman that commercial entities (frequently) wished to restrict these freedoms, for commercial gain, in direct challenge to the academic norms, and in consequence the Free Software movement was born.

In academia, unrestricted access to knowledge and information is prized. The Free Software movement regards software as knowledge and information, and works to ensure that free access to computer software is similarly encouraged.[44] Schools' culture, as a subset of academia, similarly prizes access to knowledge and information. The schools contracts, therefore, to the extent that they have the effect of restricting use, analysis and sharing of software, are in opposition to this norm and are not conducive to fostering a learning environment which encourages exploration, interaction and collaboration (essentially, 'hacking' in the Stallman sense[45]). This is exacerbated when it is considered that the contracts go further and may restrict use, analysis and sharing of other digital assets, such as text, music and images which may have similar pedagogical value.

5.2. Legal inconsistencies - classification of contract clauses

We classified clauses by determining whether they impinged upon each of the four freedoms. During such classification, it became clear that these were related to the bundle of exclusive economic rights reserved to the copyright owner (of software) by virtue of copyright law. Those rights are (1) copying; (2) modification and (3) distribution. The interaction can be shown in the following matrix (an 'x' in the box showing that, for the freedom indicated by the row containing the x, copyright licences covering the restricted acts in the marked columns are required, see table 1).

42 http://www.oreilly.com/openbook/freedom/ch01.html

43 In Stallman's terminology, a 'hacker' is a programming expert who takes a playful, skilled and often oblique approach to solving software problems, possibly in a way that the original author never intended or envisaged, but it has no negative connotations associated with unauthorised access to systems, vandalism or copyright infringement. The term 'hack' is construed accordingly.

44 So, a permissive, or 'academic' licence, described above, encapsulates the idea of granting the widest possible rights to recipients of the software, to use, modify and share the software, in tune with these norms.

45 GPLv3, section 8

	Copying (reproduction right[46])	Modification (translation, adaptation etc.[47])	Distribution[48]
F0: Run[49]	x		
F1: Study and modify	x	x	
F2: Redistribute	x[50]		x
F3: Redistribute modifications	x	x	x

Table 1: Relationship between freedoms and exclusive rights reserved to the copyright owner.

The classification we have adopted follows the four freedoms, but in determining their legal effect, we have also borne in mind the categories of acts restricted by copyright. The three categories referred to above are derived from the Computer Programs Directive. Since the restrictions contained in the schools' contracts also, in certain cases, cover digital assets other than computer programs, we also, where appropriate, refer to the additional right of 'communicating to the public', derived from the Copyright Directive which may encompass rights such as performance of a play or a piece of music.[51]

5.3. 5.3 Review of contract clauses

We reviewed each contract, and extracted (and translated into English) those clauses which we determined to have an impact on any one or more of the four freedoms. In a number of cases the same (or a very similar) clause was found across more than one contract, in which case we have only commented once. Footnote 58 explains the referencing methodology further.

The contract clauses below are not an exhaustive list, but illustrative of relevant issues contained in the contracts.

Freedom 0: The freedom to run the program as you wish, for any purpose:

Restrictions here include limitations on use for particular activities:

> *A pupil who borrows a computer for his/her studies in school district C [primary/secondary school] may only use it to study. Unless the computer is being used for study, it should immediately be returned to the school [U1].*[52]
>
> *The equipment [hardware and software] must not be used for commercial purposes [U2].*

46 Computer Programs directive 2009/24/EC, Art. 4.1(a)
47 Computer Programs directive 2009/24/EC, Art. 4.1(b)
48 Computer Programs directive 2009/24/EC, Art. 4.1(c)
49 There is an argument that if software is run on a SaaS basis, it may be being 'communicated to the public'. 'Communication to the public', while a restricted act under 2001/29/EC (Copyright Directive) is not specifically referred to in the Computer Programs Directive. van Eechoud (Harmonizing European Copyright Law: the Challenges of Better Lawmaking) argues that, by analogy with the Database Directive, the exclusive right of controlling communication to the public is not applicable to software. However, it will be applicable to other forms of copyright work.
50 Theoretically, someone could take a copy of software they had received (on a CD for example) and redistribute it by passing the physical data carrier on: in this case, no copying will have taken place. In practice, this is becoming an increasingly rare mode of distributing software.
51 Copyright Directive Art. 3 2001/29/EC Art 3
52 [U1] is a key to the relevant entry in the grid in the appendix, containing the original Swedish. Each contract extract in this paper is accompanied by a corresponding key.

> *The computer equipment must not be used in any commercial context, i.e. where the computer is used for any computing activities with a view to monetary gain [U3].*
>
> *The computer may only be used for education [U4].*

In addition to potentially conflicting with Freedom 0 in relation to the use of software, these restrictions may further directly contradict activities that schools frequently carry out: for example, schools may encourage students to start small businesses, or undertake activities which tie in directly with their academic studies, such as making and performing music (these restrictions will, naturally, impinge on both FOSS and proprietary software).

Use restrictions may also extend to restrictions on use in particular locations:

> *Copying or using the school's software outside school is not permitted [U5].*[53]
>
> *The ... child ... has the right to make use of the computer [only] at school and in their own home [U6].*

Aside from FOSS compliance issues, this latter restriction seems to have the (presumably) unintended consequence that the student cannot use the computer when away from home on holiday, in the local library, or when studying with a friend at his or her house.

These restrictions also highlight another issue, to which we return: is the restriction on the use of the hardware itself, or on the use of the software? This is particularly relevant when we consider whether the schools' contracts may be in legal conflict with the terms of the licences.

Freedom 1: The freedom to study how the program works, and change it:

Several contracts contain clauses which seek to restrain the students' right to modify the software:

> *Installed software may not be uninstalled and it is not permitted to install other software [M1].*[54]

Interestingly, some of them contain a justification for this:

> *The programs contained in the computer's default configuration may not be uninstalled since they are required for schoolwork [M2].*
>
> *The software included in the computer's default installation may not be modified or uninstalled. It has been carefully selected to be used for school work and teachers will assume that all pupils with a personal computer also have access to this software [M3].*

Freedoms 2 and 3: the freedom to copy and redistribute software, including modified copies:

Copying and redistribution are also prohibited in a number of contracts.

As well as prohibiting copying, the following extract also prohibits installation on computers belonging to other people (distribution).

> *It is also prohibited to copy the software on your computer and install it on other computers (e.g. at home) unless the school has given permission to do so [D1].*

53 At the time of writing the paper, the municipality reported only making proprietary software available. However, this does not mean that the relevant schools may not seek to provide FOSS under these rules in the future. Note also that, as in the English translation, the original Swedish is equally ambiguous as to whether this means 'outside the context of school-related activities' or 'outside the physical school premises'. We assume, from the context, that, since the students are expected to take the laptops home, that the former interpretation is intended.

54 We do not regard a restriction on installation as a restriction on the software (so of relevance to FOSS licensing and the four freedoms), but as a restriction on hardware. Uninstallation, however, does modify the software, and is therefore a relevant restriction.

This clause prohibits both modification and distribution:

> *The pupil may not tamper with or distribute the software that the school provides [D2].*

This clause prevents distribution:

> *File-sharing of copyrighted materials is prohibited at all times [D3].*

The following clause is interesting: it acknowledges that the student has control over his/her computer, by confirming their administrator status. However, it only allows the software to be copied onto other computers with the school's permission: to require the school's permission to distribute GPL software licensed to the student is a further restriction.

> *You are a local administrator on your computer which means that you can install software on your computer. Hence, you are also responsible for ensuring that only software with valid licenses is installed on your computer. Copying the software on your computer and installing it on other computers (e.g. at home) is also prohibited unless the school has given permission to do so [D4].*

6. Implications and resolution of legal inconsistencies between FOSS licenses and school contracts

In this section we analyse the implications of the identified inconsistencies, and suggest a possible resolution. To understand some of the legal reasoning, it is important to understand the meaning of the term 'distribute' as it is understood in copyright law.

6.1. On 'distribution'

The GPL family of licences[55] imposes specific conditions on a school when it distributes the software to the students. 'Distribute' is a specific term of art, and is defined with reference to copyright law, not the language of the GPL. GPLv2 (and LGPLv2.1) explicitly use the word 'distribute'. GPLv3 (and LGPLv3) use the words 'conveying' and 'propagating', but explain that 'conveying' includes distribution where a third party can make and receive a copy.

If the student gains access to the software without a legal distribution having taken place, the school will not have violated the relevant GPL licence. This is not so far-fetched as it seems: many web services are based on the service provider operating modified GPL software, in the understanding that although the end-user is able to benefit from the use of the software, the software is not actually distributed to them.[56] This is known as a SaaS (software as a service) model. By way of example, Google provides applications such as Google Docs and Gmail. These applications run on Google's servers and the end-user is given access to them through a web-browser. The end-user has access to the applications' functionality, but not the underlying code which runs on Google's servers, under Google's control, at all times. Accordingly, no distribution has taken place,[57] and Google would be able to use modified GPL-licensed software to provide the applications, without being required to make the source available and license the modifications

55 With the exception of the Affero GPL licences, which expand on the definition of 'distribute' somewhat. None of the schools reported providing any software released under Affero GPL.

56 This has been characterised by some as a flaw in the GPL, and described as the 'ASP loophole', [https://www.fsf.org/blogs/licensing/2007-03-29-gplv3-saas] hence the introduction of the Affero GPL. Miriam Ballhausen Ballhausen, 2014 (http://www.ifosslr.org/ifosslr/article/view/103) has argued that under German Law, use of GPL code, even in an ASP model, could trigger the requirement to release the source. We do not consider that argument further, although initial discussions with Swedish counsel suggest it would not apply under Swedish Law.

57 This analysis is slightly over-simplified: many SaaS applications do distribute portions of code, often JavaScript, for running on the user's computer, in the browser. To the extent that such distribution occurs, the licensor would have to comply with the relevant clauses of the underlying software licence.

under the corresponding version of the GPL.

It is not immediately clear that if the school loads software onto a laptop, and then lends that laptop to a student (so that the school retains ownership of the laptop), that there has been a distribution in the legal sense (so the school retains the licence itself, and is merely allowing the student to access the functionality of the software). It is also worth noting that, a number of municipalities have taken an initiative to form a separate entity to facilitate the administration of school laptops (possibly among other functions). The separate entity will generally purchase the laptops, lend them to the students, and may also be responsible for loading the software. Finally, another model involves municipalities signing a contract with a separate supplier, and that supplier installs the software and provides the laptops to the students.

Of the three models above, the final two appear to present a greater opportunity for distribution to take place (and hence the copyleft provisions of the GPL to apply).

A complex legal analysis to determine whether distribution has taken place is beyond the scope of this paper, but it is clear that there is a spectrum of use cases with a varying likelihood that distribution has occurred at law.[58]

6.2. Legal Implications of inconsistencies

A number of the restrictions contained in the schools' contracts potentially cause legal issues for the schools concerned. As we have seen the contracts, where they are signed by under-18s, are unenforceable under Swedish law. We contend, however, that, even if this is the case, a failure to comply with the contracts may, *in extremis*, result in disciplinary sanctions being applied against the student, and that they still have the effect of 'further restrictions' under the GPL licences.[59]

We have seen that a number of the schools in question deploy FOSS. On the assumption that those items of FOSS are installed by the school onto laptops which are then given to students, to the extent that the school is distributing the software (in the legal sense), the school will be required to comply with the relevant FOSS licence when distributing to the student. If the relevant licence is part of the GPL family for example, the school is not permitted to apply additional or further restrictions to any recipient's licence to the software. A practical example would be GIMP (an image manipulation tool with similar functionality to Photoshop[60] and is released under GPLv3 or any later version[61]).

The municipality which uses the following statement in its contract also provides GIMP:

> *Copying the software on the computer and installing it on other computers (e.g. at home) is also prohibited unless the teacher/system administrator has given written permission for it [C1].*

The school itself receives the software under GPLv3 or any later version, so in order to comply with its terms when distributing the software to the student, the school has also to make the software available under that licence, crucially, without imposing any additional restrictions. Section 10, GPLv3, states:

> *You may not impose any further restrictions on the exercise of the rights granted or affirmed under this License*

58 There are European Court Cases which suggest that distribution of software can only occur when there is an accompanying transfer of a physical item: Peek & Cloppenburg KG v Cassina SpA Case C-456/06 . This doctrine does pose a difficulty for software licensing within virtual machines (VMs) and when downloaded. This issue is outside the scope of this paper, but see also UsedSoft GmbH v Oracle International Corp (C-128/11)

59 It is clear from the examples of further restrictions given by the Free Software Foundation, that they did not solely have enforceable contractual obligations in mind. http://www.gnu.org/licenses/gpl-faq.html

60 Proprietary software provided by Adobe Systems Incorporated

61 Since GPLv3 is the current version of GPL, the analysis can, at the date of writing, only be undertaken under GPLv3

If the school distributes GIMP to students (in the terminology of GPLv3, 'conveys'), and in doing so, applies a restriction which seeks to limit the student's right to copy the software:

> *...You may ... propagate covered works ... without conditions... (GPLv3, Section 0)*

where:

> *...Propagation includes copying... (GPLv3, Section 2)*

by imposing a further restriction on a recipient's exercise of rights under GPLv3, the school would itself be in breach of GPLv3 if it makes such a distribution. The effect of this is two-fold. First, the school itself would be in breach of copyright by making an unauthorised distribution of the software[62]. Second, the school is in danger of losing its own licence to GIMP:

> *You may not propagate or modify a covered work except as expressly provided under this License. Any attempt otherwise to propagate or modify it is void, and will automatically terminate your rights under this License [...further provisions allowing reinstatement in certain circumstances if the violation ceases]. (GPLv3, Section 8)*

A similar example is Audacity, a sound recording and manipulation program, licensed under GPLv2. A municipality which has reported its schools using Audacity also places in its student contract the following:

> *The programs contained in the computer's default configuration may not be uninstalled since they are required for schoolwork [M2].*

The analysis here is similar, but not identical to the GIMP/GPLv3 analysis.

The school obtains Audacity under GPLv2. GPLv2 provides that:

> *You may not impose any further restrictions on the recipients' exercise of the rights granted herein.*[63]

If the school distributes Audacity to students, a restriction on uninstalling (modifying) Audacity will be a further restriction under the school's licence to use Audacity. The school is therefore in breach of its own licence to use Audacity.

6.3. Partially resolved inconsistencies

In this subsection we highlight examples of clauses where contracts go some way to addressing potential inconsistencies.

Some schools only prohibit actions impinging on the four freedoms where that activity is unauthorised:

> *It is forbidden and a criminal act to copy software that is protected by copyright without authorisation [A1].*

Some schools acknowledge that only appropriately licensed software may be used:

> *It is not allowed to install software for which you do not have valid licenses*[64] *[A2].*

Some schools (try) to recognise that the model for licensing free software is different:

> *It is forbidden by law to copy the software, any violation will be prosecuted.*

62 This does not adversely affect any rights the student receives: GPLv3, section 7.
63 GPLv2 Section 6
64 This does not admit that, in theory, it is possible to use software which is covered by a copyright exception or is in the public domain, but see footnotes 73 and 76.

Shareware and Freeware is not covered by this [C2].

Note the last sentence: we will charitably assume that the school meant 'free software' (in the sense understood by the Free Software Foundation) by using the term 'Freeware' (the specific term 'Freeware' is used as written in the original Swedish wording).

6.4. Resolution of inconsistencies

The most comprehensive way to resolve all inconsistencies (including those of culture) will be for the municipalities to review the contract(s) they have with the students, and ensure that:

1. They correctly characterise copyright, and avoid the assumption that all copyright materials (both FOSS and other digital asset) are not able to be copied (used or distributed); and
2. They acknowledge that free and open source software can have pedagogical benefits over and above its use as an application: namely that by studying, modifying, copying and sharing the code the student can gain a deeper understanding of software, its design, development and applications; and
3. They appropriately deal with restrictions which impinge on FOSS licences, ensuring that no conflicts remain.

Examples of recasting problematic clauses in a more acceptable fashion are presented in table 2.

Ref	Original Wording	Suggested Improvement
M3	The software included in the computer's default installation may not be modified or uninstalled. It has been carefully selected to be used for school work and teachers will assume that all pupils with a personal computer also have access to this software.	The software included in the computer's default installation may not be modified or uninstalled unless the specific licence applicable to that software permits you to do so. However, since the software has been carefully selected to be used for school work, teachers will assume that all pupils with a personal computer also have access to this software in its original configuration. Modifying or uninstalling the software may make it difficult or impossible to complete the course. Where you do want to modify the software, and the licence allows you to do so, we suggest you make a separate copy of it and modify that, leaving the original version available for use in your studies.
U3	The computer equipment must not be used in any commercial context, i.e. where the computer is used in any computing activities with a view to monetary gain.	The computer equipment must not be used in any commercial context, i.e. where the computer is used in any computing activities with a view to monetary gain, unless that use is required as part of your studies or otherwise permitted by your school. If you want to use any FOSS installed on the computer for commercial or other non-educational purposes, we suggest you copy it to a different computer of your own for that purpose.
D1	It is also prohibited to copy the software on your computer and install it on other computers (e.g. at home) unless the school has given permission to do so.	It is also prohibited to copy the software on your computer and install it on other computers (e.g. at home) unless the school has given permission to do so, or copying and installation is permitted by the licence applicable to that item of software.
D3	File-sharing of copyrighted materials is prohibited at all times.	File-sharing of materials subject to copyright is prohibited except where you have a valid licence (such as a Creative Commons or FOSS licence), or it is otherwise permitted under copyright law.
C2	It is forbidden by law to copy the software, any violation will be prosecuted. Shareware and Freeware is not covered by this.	The law prohibits copying software unless you have a valid licence to do so, or you are otherwise permitted to do so under copyright law. Free and Open Source software is licensed under terms which **do** permit you to copy the software, but you should read the applicable licence carefully to make sure you comply with any conditions it contains.

Table 2: Examples of how problematic clauses can be improved.

To balance the schools' legitimate expectation that the laptops will contain certain applications which will function as intended for pedagogical purposes, we propose that it would be acceptable to say that, notwithstanding the student's exercise of his/her rights under FOSS, at least one instance of the application in question is present and configured in the way required by the relevant course (see suggested wording for M4 in the grid above).

The minimum resolution (from a legal perspective) is for the schools to make a legally binding declaration, to all students who have received laptops from the schools, that the schools will not assert their rights under the student contracts to the extent that those rights are inconsistent with the rights granted to the student under the terms of the relevant FOSS licences (which avoids an in-

depth analysis and redrafting the student contracts to ensure compliance.[65] However, this solution may work from a legal perspective, but it does little, in itself, to foster the exploration, experimentation and collaboration which FOSS facilitates.

It has been suggested that cloud computing may avoid many of these issues. Although this may remove issues related to software licensing per se,[66] it still means that the students will have to enter into application access agreements, which raise their own issues (which we briefly consider later). Further, since the students will no longer be able to run the software itself (as opposed to being granted access to its functionality), even if it is FOSS (unless it is subject to one of the small number of licences which seek to close the 'ASP loophole'), they will be unable to benefit from the Four Freedoms.

These issues are not limited to software: not only is the software itself affected by these restrictions, but content (such as photographs, text, videos and music) are also copyright works which are potentially subject to licences, such as the Creative Commons suite of licences. In a similar manner to free and open source software licences, Creative Commons licences are intended to encourage reuse and redistribution. There are a number optional components of the licences, which are denoted by the tags BY, SA, ND and NC, as selected by the copyright owner.

For example, someone may take a photograph and want to make it available under a Creative Commons license which only allows recipients to use it without modification, provided that the photographer is credited. In that case, she would choose CC-BY-ND,[67] BY indicating that attribution is required, and ND indicating that the recipient may only use the work as-is, without making any modifications ('no derivatives'). The other tags are SA (share-alike, which is similar to copyleft) and NC (which means non-commercial). With the exception of NC and ND licences,[68] the CC variants are, effectively, FOSS licences and grant the four freedoms. The CC licences do (like the GPL family of licences) prohibit the imposition of additional restrictions which contradict the rights granted by the licence. Thus, where restrictions in the school contract cover other materials[69] which be licensed under CC licences, a similar analysis to that undertaken in relation to GPL holds true. Where the item in question is not computer software, copyright law allows for the additional exclusive right of authorisation, which is the right of communicating to the public. Further discussion of this is outside the scope of this paper.[70]

7. On misconceptions concerning copyright

Copyright is a right which arises automatically upon the creation of certain categories of work (for example, literary, graphical, photographic, musical) and belongs to the author of the work (or his or her employer). It grants a number of rights which are exclusive to the rights holder: primarily, the exclusive right to copy the work, make adaptations of it, distribute it to the public and (in relation to works other than computer programs) communicate the work to the public. These rights last for a significant period of time (generally, under EU law, 70 years from the death of the

65 A similar mechanism is employed by the Open Invention Network: see section 5.4 of its license agreement: http://www.openinventionnetwork.com/joining-oin/oin-license-agreement/

66 But see footnote 56

67 The current latest release of the Creative Commons suite is 4.0. See https://creativecommons.org/licenses/by-nd/4.0/ for more information.

68 Prohibiting the use of software for commercial purposes is a breach of Freedom 0 – the freedom to run the program as you wish, for any purpose. Further, it's not clear what 'commercial purposes' means.

69 It is theoretically possible for software to be licensed under a Creative Commons Licence – and for non-software content to be licensed under a FOSS licence, but this is not recommended, not least because the structure and terminology contained in those licences is not appropriate when applied to an unintended medium. Having said that, the Creative Commons foundation has announced that materials licensed under CC-BY-SA 4.0 may now be relicensed under GPLv3 (but not vice versa): http://creativecommons.org/weblog/entry/46186

70 There also exist additional rights, such as moral rights, which are outside the scope of this paper.

author). Computer programs are, under EU law, protected by copyright as literary works.[71]

The rights holder can permit others to use the work (for example, a software company can permit its customers to use the work) by issuing a licence: it is useful to remember that a licence is defined as a permission to do something which would otherwise be illegal.

However, aside from obtaining a licence, there are several other ways in which someone can lawfully make use of a copyright work without obtaining a licence.

The Berne convention forms the basis for copyright in almost all countries worldwide. Articles 9, 10 and 10bis permit countries to legislate certain 'free uses' of copyright materials which do not require authorisation. The Copyright Directive makes use of this permission, and in Article 5, it allows various exceptions to be incorporated into the laws of member states. In practice, the extent and scope of these rights varies from member state to member state. Swedish law has a number of separate statutory exceptions to copyright which allow, for example, the use of extracts of texts in academic papers without the consent of the rights holder provided that attribution is given. For example, assume a student wishes to incorporate short extracts from a work of literature in an essay criticising that work. This right is a specific exception to copyright under Swedish law so no licence would be required,[72] provided that appropriate attribution is given. Despite these clear rights, some of the contract statements suggest that no materials downloaded from the internet may be used at all, even if licensed, or subject to a statutory exemption.

Further, there are many materials available on the internet that are licensed under licences which also permit and encourage use, reuse and dissemination, such as the Creative Commons suite of licences (see above).

Examples of statements which suggest that certain uses of copyright materials are never legitimate are as follows:

> *File sharing of copyrighted materials is prohibited at all times [D3].*
>
> *Examples of materials with illegal or inappropriate content are: material protected by copyright [X1].*
>
> *Copying programs and data files that are protected by copyright is not permitted [X2].*
>
> *Copyright also applies to the Internet. It is therefore not allowed to copy or make use of copyrighted texts, movies, images or music pieces etc. [X3].*

Examples of statements which ignore fair use,[73] or the public domain are:

> *Unauthorized copying of software or use of unauthorized software entails personal liability towards licensors [X4].*

Some statements go further, and indicate that copying materials is a criminal offence:[74]

> *It is forbidden by law to copy the software, any violation will be prosecuted [X5].*[75]

71 2009/24/EC

72 If more than 70 years have elapsed since the death of the author, the work will have entered the public domain, and copyright law will impose no restrictions at all.

73 Swedish law does not have a concept of 'fair use' as such, but the term is used as shorthand for the bundle of exceptions which exist in certain circumstances, such as the right granted to cite and quote materials in an academic context, provided that appropriate attribution is given. See Chapter 2 of Law 729 of 1960 on copyright in literary and artistic works (Kap 2, Lag (1960:729) om upphovsrätt till litterära och konstnärliga verk).

74 Copyright infringement may be a criminal offence in Sweden, subject to some exceptions (for example copying software for private use if the original has not been used in a commercial or public sector context).

75 Although this statement [C2] also goes on to exclude 'Freeware' and 'Shareware' from this requirement.

> *When installing software that violates copyright law, the pupil risks a police report being filed [X6].*

Occasionally, the school mangles terminology:

> *Copying software other than so-called freeware is not permitted. Copying other types of software is forbidden by law [X7].*

In this case, we assume that by using the term 'freeware', the school means 'FOSS' (and other forms of licence, such as shareware, where copying is explicitly permitted). Note that this statement also ignores the possibility of fair use.[76]

Some statements confuse a number of issues:

> *Most software has rules for its use. Licenses for school software are handled by the computer department. It is absolutely necessary that the school can show that there are paid licenses for software used. The school takes no responsibility for unlicensed software installed by pupils [X8].*

By suggesting that some software has rules for its use, it implies that some software has no rules. That's true, but there is very little software which falls under this category (possibly software which has been released under the CC0 licence which attempts to be a dedication to the public domain, or where that fails, an extremely liberal licence removing as many restrictions as possible). Even liberal FOSS licences like BSD retain some 'rules', in terms of retaining a disclaimer or attribution, for example. This statement strongly suggests that proprietary paid-for licences are the norm.

> *Installing or copying software or other material protected by copyright law or agreement is forbidden. You are solely responsible for ensuring that the necessary licenses are available for all materials that are not directly provided by the school [X9].*

It's not clear how software can be protected by 'agreement' (as opposed to copyright law). The first sentence suggests that installing or copying all material protected by copyright is forbidden (even with a valid licence, or where fair use applies), whereas the second sentence, in contrast, suggests that installing such software is legitimate as long as there is an appropriate licence.

> *Under Swedish law, it is forbidden to ... copy software and games that are not free of charge. Explanation: What would those who make software live off if nobody pays? [X10]*

This seems to suggest that free (gratis) software can be copied without restriction (which is not necessarily true), and attempts to explain the rationale behind copyright (a rationale which is refuted by the very existence of the free software referred to in the first sentence).

8. Analysis

From an analysis of our results, we make a number of observations. Concerning the provision of FOSS in Swedish Schools, we found that FOSS provided was licensed under a wide variety of different licences, the licences in question covering the spectrum of strong copyleft (e.g. GPL) through to permissive (e.g. Apache) licences. Concerning the relationship between schools' contracts and FOSS licences, we found that there were several inconsistencies, some of which

76 ...and the public domain, but the reality is that, owing to the length of the copyright term and the relatively recent invention of stored-program computing, it is unlikely that any software is in the public domain– at least in jurisdictions like Sweden where copyright works cannot be dedicated to the public domain (although the economic rights can be waived).

demonstrated a mismatch between the explicit contract wording and FOSS culture and others of which had legal implications. The legal implication of the inconsistencies was that the schools themselves could be in breach of the specific FOSS licence(s) applicable to the FOSS which the school provided. Our results show that the inconsistencies could be resolved by applying a simple (but strictly legalistic approach), or adopting an approach in which both FOSS culture, and the legal implications, are effectively addressed. Finally, analysis of our results shows that the contracts, together with other documents which were obtained as part of the broader study, contain a number of misconceptions as to the nature and effect of copyright and certain licensing models. From our results it seems evident that those preparing the contracts have failed even to consider certain licensing models, or whether copyright works may be lawfully used in specific circumstances without a licence.

A common thread emerges both from the statements we identified as containing misconceptions, and other supporting documents we have obtained in the course of the study. Specifically, there was no case in which a statement or assumption about copyright mistakenly suggested that the student had more freedom to use, copy, modify or distribute any software or other material than was permitted by law. On the contrary, every such statement suggested that the rights that the student had were narrower than those guaranteed by law.

One explanation of this may be that the schools were naturally conservative, and assessed that it was less risky (and simpler) to adopt a more restrictive stance in communicating to the students than was strictly necessary. However, given that the nature of many of the statements increases risk, in terms of inviting infringement of FOSS licences as discussed above, and given that many statements suggest an insufficient understanding of the licensing context and copyright law itself (for example, references to 'freeware') we are not convinced that the contracts, in the main, are the result of a careful risk-assessment exercise.

It may also be the case that the wording of the contracts dates from earlier governmental initiatives for increasing IT skills (before the widespread adoption of FOSS applications) which tended to favour proprietary solutions.

Another, more interesting explanation may lie in the fact that the public's exposure to messaging about copyright has been dominated by the rights holders. This is illustrated by the prevalence of anti-piracy messages in videos, DVDs and BluRay discs, both in Sweden and elsewhere, which mischaracterise copyright infringement as theft, and fail to mention any rights of fair use. Messaging from the Swedish Government[77] itself reinforces this:

> *You should not take someone else's movies, music, text or images, and put them on the Internet without permission of the author. This means that you may not share their music or film collection on the Internet, for example, via a file sharing program. However, they may of course add music, pictures, or anything that you yourself have created.*[78]

There are plenty of public domain works which may be freely published,[79] including many prominent works of literature from Strindberg[80] to Shakespeare,[81] many of which will have

77 Document published by the Swedish Government, Ministry of Justice: Regeringskansliet (2005) Upphovsrätten vid nedladdning och annan kopiering av musik, film och bilder, Justitiedepartementet, Sweden.

78 Swedish original: Man får inte ta någon annans filmer, musik, texter eller bilder och lägga ut på Internet utan tillstånd av upphovsmannen. Detta betyder att man inte får dela med sig av sin musik - eller filmsamling på Internet, t.ex. via ett fildelningsprogram. Däremot får man förstås lägga ut musik, bilder eller annat som man själv har skapat

79 See, for example, Project Gutenberg: https://www.gutenberg.org/, with the warning that the rules under which works enter the public domain vary significantly from jurisdiction to jurisdiction, so it is not automatically safe to assume that works on that site are free of copyright in your jurisdiction. In a Nordic context, project Runeberg aims to make available classic Scandinavian literature on a similar basis to Project Gutenberg http://runeberg.org/

80 e.g. https://www.gutenberg.org/files/48052/48052-h/48052-h.htm

81 e.g. http://www.gutenberg.org/cache/epub/2264/pg2264-images.html

significant pedagogical value. It is highly misleading to suggest that all works are only capable of dissemination with the author's permission[82] (leaving aside, for the time being, that the author is, very often, not the rightsholder in any event).

Further, although the first sentence introduces the concept of author's permission, the second sentence assumes that this will never be given. By way of example from the field of images, there were, at the time of writing,[83] 355,110,899 photographs and other images on flickr.com for which the author had given precisely this permission.[84] By contrast Getty Images, one of the most prominent commercial image banks in the world, lists less than a quarter of this total: 80 million images.[85]

File sharing programs, including peer-to-peer networks like bit-torrent have significant non-infringing uses. Many FOSS companies use bit-torrent to distribute their software, especially where the file size is particularly large such as a Linux distribution.[86] The BBC incorporated peer-to-peer networking in early versions of iPlayer, released before it had access to the bandwidth needed to stream directly.[87]

Sweden, as home to the (in)famous Pirate Bay torrent-indexing site,[88] is no stranger to controversy surrounding copyright infringement. Stockholm, has, in consequence been described[89] as the "world capital of Internet piracy" and Sweden was the first country to implement the IPR Enforcement Directive (IPRED) (2004/48/EC). Reporting of the Pirate Bay case in Sweden (and elsewhere) tended to imply that file sharing is *per se* unlawful activity, conflating the peer-to-peer technology itself and its role in facilitating infringement and hence reinforced misconceptions about the lawfulness (or otherwise) of file-sharing.

Similar misconceptions, biased towards the rightsholders, have permeated through to schools, and in a number of cases, documents which were obtained as part of the broader study specifically referenced the misleading paper published by the Swedish Government referred to above.

In general it is to be welcomed when students acquire a basic understanding of copyright in schools and our analysis shows that some schools have initiatives for promotion of such an understanding amongst students. However, given that an understanding of copyright may be a learning goal for students, including students as young as those in the sixth grade,[90] then it is a concern that there are misconceptions concerning copyright in some schools.

A failure to understand copyright properly, and lack of knowledge about the availability of software and materials available under FOSS and Creative Commons and similar licences may lead to several problems, including:

1. Exposure of the school to liability by failing to comply with FOSS licences itself;
2. Failure of the school to take advantage of the pedagogical opportunities presented by the ability of FOSS licences to facilitate to exploration, sharing and collaboration;

82 It would be possible to strain the interpretation of 'someone else's...text' so that it meant 'text the copyright of which is owned by someone else', which would exclude works in the public domain. However, an instinctive reading of 'someone else's...text' does not immediately exclude Strindberg and Shakespeare from that category. Given that this is a document intended to clarify the public's rights, the phrasing is misleading.

83 13 October 2015

84 Under various Creative Commons licences, or public domain dedication or notices: https://www.flickr.com/creativecommons/

85 https://en.wikipedia.org/wiki/Getty_Images

86 e.g. Ubuntu: http://www.ubuntu.com/download/alternative-downloads

87 https://en.wikipedia.org/wiki/BBC_iPlayer

88 It's misleading to call it a file sharing site, as it never hosted the files themselves.

89 See page 391 in: Fung, W. M. J. and Lakhani, A. (2013) Combatting peer-to-peer file sharing of copyrighted material via anti-piracy laws: Issues, trends, and solutions, Computer Law & Security Review, Vol. 29(4), pp. 382-402. http://dx.doi.org/10.1016/j.clsr.2013.05.006

90 In the Swedish schools system, this means the year in which children turn 12.

3. Failure of the school to make use of materials available under free licences; and
4. Additional and unnecessary expenditure caused by different types of lock-in.[91]

From our results, we observed a number of related issues arising from documents obtained as part of the broader study. Licensing issues arose not only in relation to software; licensing issues can arise in the use of associated digital assets. For example, in addition to licence conditions for the provision of software, there is the related issue of understanding font licensing.

Analysis of one of the documents obtained as part of the broader study revealed that staff (including teachers in schools) were required to conform to a style guide containing specific rules as to format, appearance and layout of documents. As part of that requirement a named typeface was mandated for use, namely Calibri.[92] Calibri was originally created by Microsoft Corporation for use in Office 2007, and, although it comes bundled with Microsoft's Office suite of products and is therefore widely available, its use does require a licence, either as part of the bundled Microsoft package, or on a separately paid-for basis through Microsoft's licensee Monotype. We note that such a requirement implicitly promotes use of assets under a proprietary licence (either indirectly, under the licensing of Office, or directly through the requirement to obtain a proprietary licence for the font from Monotype).

From this analysis it may be considered that only FOSS licences are affected by misconceptions and inconsistencies. However, our results also show that licences and access rights relating to SaaS are affected.

From our results we find from analysis of the requested documents that a number of public sector schools have agreements with a number of different cloud (SaaS) providers and that those schools expect their students to use the cloud services provided. However, in our study we have not obtained any documented evidence to suggest that schools have undertaken the recommended risk assessment and review of conditions for use of specific cloud services before providing these services to students. Lack of such a risk assessment may be seen as surprising given that such recommendations have been developed and published by the organisation which represents all public sector schools.[93]

For example, amongst contracts obtained from schools we identified that potential disputes related to students' use of services provided in a cloud solution will be handled in a U.S. based court (California) since schools have agreed to such conditions in the contract. We would have expected this to be an issue covered in an appropriate risk assessment.

Our results show that software is made available to students under the age of 13 (and that, therefore, schools contracts apply to such students). Previous research results from Swedish schools[94] identified that some schools "forbid people under the age of 13 to use Facebook" and some enforce "the rule to not access Facebook is agreed upon via contracts written when the computer is provided." However, interestingly, in the contracts analysed in this studysuch rules were not identified.

9. Discussion and conclusion

To meet future challenges it has been suggested from industry that Sweden needs to promote

91 Lundell, B. (2012) Why do we need Open Standards?, In Orviska, M. and Jakobs, K. (Eds.) Proceedings 17th EURAS Annual Standardisation Conference 'Standards and Innovation', The EURAS Baard Series, Aachen, ISBN: 978-3-86130-337-4, pp. 227-240.
92 Style guide for an organisation obtained during data collection.
93 See page 20 in: E-delegationen (2010) ibid.
94 See page 99 in: Hatakka et al. (2012) ibid.

creativity and include coding skills in its school system, as early as in the primary school system.[95] One may conjecture that adoption of FOSS may constitute one important enabler for successfully addressing such challenges.

From our analysis, we have found that the existing schools contracts suggest a bias (which may be unintentional) towards the implicit promotion of proprietary software and SaaS.

Since no documented risk assessment from analysis of conditions for use of cloud services was obtained in our study, one may conjecture that the outcome of such a risk assessment of conditions for use of cloud contracts for individual students in schools and their guardians would have taken issues concerning managing disputes involving students in different jurisdictions into account. Further, we were surprised to find that we were not able to identify any documented risk assessment in our study, especially since software and services are provided (under different conditions) to young students in schools.

To fully take advantage of the learning opportunities presented by FOSS, schools must both foster an environment in which the benefits of FOSS, including the benefits of FOSS culture (providing exploration, sharing and collaboration) as well as the software's functionality are more fully exploited. Avoiding contracts which inhibit the provision and use of FOSS is an important step towards this goal. Further, before adopting any type of SaaS or software (whether proprietary or FOSS), the acquiring bodies should follow the recommendation to undertake a risk assessment which considers the effect on the acquiring body and the users (in this case, the individual teachers and students). Since students are in a special type of relationship with the school (they are not employees of the organisation which provides the software or SaaS, but nonetheless it may, in effect, be compulsory for them to use the provided solution), the risk assessment needs to be carefully undertaken to take this relationship into account.

We take care in making our recommendations that they do not exclude or disfavour proprietary licensing. We have provided example modifications of contract clauses. The examples are constructed to demonstrate how changes are able to address the concerns relating to FOSS without discrimination either in favour of FOSS on the one hand, or proprietary solutions, on the other. From this it can be seen that the exercise of reviewing the contracts to render them both legally compliant and in accord with cultural norms which are also applicable to FOSS is not complex.

The suggested resolutions offered in this research do not require disproportionate effort to adopt in an educational context, and as well as resolving the specific legal issues, the fuller solution of recasting certain clauses in the contracts addresses cultural concerns and helps to address the (perhaps unintentional) imbalance of implicit preference for proprietary solutions.

95 BCG (2015) Launching a New Digital Agenda: How Sweden Can become the global leader in Digitization and Technology, The Boston Consulting Group, June. http://www.bcg.dk/documents/file191290.pdf

10. Appendix

Ref.	English translation	Original Swedish text
U1	A pupil who borrows a computer for his/her studies in school district C [primary/secondary school] may only use it to study. Unless the computer is being used for study, it should immediately be returned to the school.	Elev som lånar dator för sina studier i Rektorsområde förskola/grundskola ska enbart använda den till studier. Om inte datorn används för studier ska den genast återlämnas till skolan.
U2	The equipment [hardware and software] must not be used for commercial purposes.	Utrustningen får inte användas i kommersiella sammanhang.
U3	The computer equipment must not be used in any commercial context, i.e. where the computer is used for any computing activities with a view to monetary gain.	Datorutrustningen får inte användas i några kommersiella sammanhang, dvs att Datorn används i datoraktiviteter i vinstgivande syfte.
U4	The computer may only be used for education.	Datorn används för utbildning.
U5	Copying or using the school's software outside school is not permitted.	Det är inte tillåtet att kopiera eller använda skolans programvara utanför skolan.
U6	The ... child ... has the right to make use of the computer [only] at school and in their own home.	Vårdnadshavarens i detta avtal angivna barn äger rätt att disponera datorn i skolan och i sitt egna hem.
M1	Installed software may not be uninstalled and it is not permitted to install other software.	Installerad programvara får inte avinstalleras och det är inte tillåtet att installera annan programvara.
M2	The programs contained in the computer's default configuration may not be uninstalled since they are required for schoolwork.	De program som ingår i datorns grundinställning får inte avinstalleras då de skall användas i skolarbetet.
M3	The software included in the computer's default installation may not be modified or uninstalled. It has been carefully selected to be used for school work and teachers will assume that all pupils with a personal computer also have access to this software.	De programvaror som ingår i datorns grundinstallation får inte ändras eller avinstalleras. De är noga utvalda för att användas för skolarbetet och pedagogerna kommer att förutsätta att alla elever med personlig dator också har tillgång till dessa.
D1	It is also prohibited to copy the software on your computer and install it on other computers (e.g. at home) unless the school has given permission to do so.	Det är också förbjudet att kopiera programvara som finns på datorn och installera på andra datorer (t.ex. hemma) om inte skolan har gett tillstånd till detta.

D2	The pupil may not tamper with or distribute the software that the school provides.	Eleven får inte manipulera eller sprida den programvara som skolan tillhandahåller.
D3	File-sharing of copyrighted materials is prohibited at all times.	Fildelning av upphovsrättsskyddat material är alltid förbjudet.
D4	You are a local administrator on your computer which means that you can install software on your computer. Hence, you are also responsible for ensuring that only software with valid licenses is installed on your computer. Copying the software on your computer and installing it on other computers (e.g. at home) is also prohibited unless the school has given permission to do so.	Du är lokal administratör på din dator vilket bland annat innebär att du själv kan installera programvaror på datorn. Därmed ansvarar du också för att endast programvaror med giltiga licenser installeras på datorn. Det är också förbjudet att kopiera programvara som finns på datorn och installera på andra datorer (t.ex. hemma) om inte skolan har gett tillstånd till detta.
C1	Copying the software on the computer and installing it on other computers (e.g. at home) is also prohibited unless the teacher/system administrator has given written permission for it.	Det är också förbjudet att kopiera programvara som finns på datorn och installera på andra datorer (t ex hemma) om inte lärare/systemadministratör har gett skriftligt tillstånd till detta.
A1	It is forbidden and a criminal act to copy software that is protected by copyright without authorisation.	Det är förbjudet och kriminellt att otillåtet kopiera programvara som skyddas av copyright.
A2	It is not allowed to install software for which you do not have valid licenses.	Det är inte tillåtet att installera program som du inte har giltiga licenser för.
C2	It is forbidden by law to copy the software, any violation will be prosecuted. Shareware and Freeware is not covered by this.	Det är enligt lag förbjudet att kopiera programvaran, överträdelse beivras. Shareware och Freeware omfattas ej av detta.
X1	Examples of materials with illegal or inappropriate content are: material protected by copyright.	Exempel på material med olagligt eller olämpligt innehåll är: material som är skyddat av upphovsrätt.
X2	Copying programs and data files that are protected by copyright is not permitted.	Det är inte tillåtet att kopiera program och data filer som skyddas av copyright.
X3	Copyright also applies to the Internet. It is therefore not allowed to copy or make use of copyrighted texts, movies, images or music pieces etc.	Upphovsrätten gäller även på Internet. Det är därför inte tillåtet att kopiera eller utnyttja upphovsrättsligt skyddade texter, filmer, bilder eller musikstycken mm.
X4	Unauthorized copying of software or use of unauthorized software entails personal liability towards licensors.	Otillåten kopiering av programvara eller användning av otillåten programvara kan medföra ett personligt ansvar gentemot licensgivare.
X5	It is forbidden by law to copy the software, any violation will be prosecuted.	Det är enligt lag förbjudet att kopiera programvaran, överträdelse beivras.

X6	When installing software that violates copyright law, the pupil risks a police report being filed.	Vid installation av programvaror som bryter mot upphovsrättslagstiftningen riskerar eleven att polisanmälas.
X7	Copying software other than so-called freeware is not permitted. Copying other types of software is forbidden by law.	Det är inte tillåtet att kopiera program andra än s.k. freeware. Övrigt är enligt lag förbjudet.
X8	Most software has rules for its use. Licenses for school software are handled by the computer department. It is absolutely necessary that the school can show that there are paid licenses for software used. The school takes no responsibility for unlicensed software installed by pupils.	De flesta programvaror har regler för hur de får användas. Licenser för skolans programvaror hanteras av datorinstitutionen. Det är absolut nödvändigt att skolan kan uppvisa betalda licenser för de program som används. Skolan tar inte ansvar för olicensierade programvaror som installerats av elever.
X9	Installing or copying software or other material protected by copyright law or agreement is forbidden. You are solely responsible for ensuring that the necessary licenses are available for all materials that are not directly provided by the school.	Det är förbjudet att installera eller kopiera programvara eller annat material som skyddas av upphovsrättslagen eller avtal. Du är själv skyldig att se till att nödvändiga licenser finns för allt material som inte direkt tillhandahålls av skolan.
X10	Under Swedish law, it is forbidden to ... copy software and games that are not free of charge. Explanation: What would those who make software live off if nobody pays?	Enligt svensk lag är det förbjudet att... kopiera program och spel som inte är gratis. Förklaring: Vad ska de som gör program leva av om ingen betalar?

Extracts from Schools Contracts, in Swedish and the corresponding translation in to English

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Twenty-five years of school? Analysis of Free and Open Source software license texts

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Abstract
The licenses of Free and Open Source Software are expected to be read and understood by all software users. Analysis of these texts shows that it is not an easily achievable goal.[1]

Keywords
Law; information technology; Free and Open Source Software; software licenses; readability

"All men are really most attracted by the beauty of plain speech."
— Henry David Thoreau[2]

Introduction

Free and Open Source software is licensed under a variety of licenses. The text of the license almost always accompanies the software on every delivery and is often included in the software itself. It is generally expected by the software authors and publishers that the users of software will be able to read and understand the software licenses that govern the use of all software and, therefore, subsequently be able to comply with all the license provisions.

The purpose of this paper is to present the results of an automated analysis of the text of the software licenses, which makes it obvious that these expectations that all license texts are read and understood by the users are not easily met.

1 The initial analysis was performed in January 2014; further analysis was completed in the first half of 2016. I am grateful to the participants of the 2014 and 2016 Legal Workshops organised by Free Software Foundation Europe in Barcelona who listened to the presentations and encouraged the publication of this work.
2 Thoreau, H.D., 'A Vigorous Prose Style' in *A Week on the Concord and Merrimack Rivers*, 1849.

Software licenses corpora

While historically, in the early days of Free and Open Source software distribution, many software packages were using their own license text, in recent times this practice has been mostly abandoned in favour of re-using one of a set of commonly used licenses.

The most commonly referenced set of Open Source licenses is that of the licenses that have been approved by the Open Source Initiative (OSI), based on their Open Source Definition. It currently contains 76 licenses.[3]

Since there are many more licenses in wide use than the ones approved by OSI, it was deemed useful to extend the analysis to a wider set of licenses. For this purpose, the entire SPDX License List[4] was selected as a comprehensive corpus of license texts. The results on this paper include the analysis on all 322 licenses present in the version 2.5 of the license list.

It should be noted that the analysis presented here only considered license texts written in English. Although there are licenses in other languages, their use is much more limited. However, a quick analysis of a handful of license texts available in other languages (French and Greek) confirmed that the same general results and corresponding conclusions can be obtained in these cases also.

Presentation of results

The results of the analysis are presented in a series of graphs in the following pages. For each metric, a pair of graphs is presented on a page: the first displays the results for all the OSI-approved licenses, while the second one contains the results for all the licenses in the SPDX license list. To distinguish the OSI-approved licenses in the second graph, they are displayed with a different, darker colour.

In all graphs, the values have been sorted numerically from smallest to largest. This allows viewers to quickly visually recognise the extreme cases, as well as the general pattern of distribution of values. The median value of any metric is the one that is obviously present in the half-way point of the horizontal axis. Each graph also displays the range of values (i.e., the minimum and maximum values) and the average of all the values, rounded to the nearest integer.

Obviously, the position of each license on the horizontal axis does not stay the same, but depends on the metric value for the text of this specific license. It would be an error to assume, for example, that the license that has the maximum value on a specific metric – and thus is placed in the rightmost position – is also on the same position in some other graph displaying the results of another metric.

This paper does not show the exact numerical results for each metric as this depends on a number of assumptions while computing the values. For example, on counting the number of words, one might consider hyphenated words as one or two; or, on counting of sentences, one might ignore – or not – the section headings. However, the general findings are valid independently from such arbitrary decisions.

Moreover, the results are presented in a cumulative and anonymised fashion for all the license texts that were analysed, without detailing or even displaying the exact metric value of each license text.

3 https://opensource.org/licenses/alphabetical
4 https://spdx.org/licenses/

This is because it is not the purpose of this paper to criticize the wording or structure of specific license texts; rather, to raise the issue that all of them share some characteristics.

Basic text metrics

The first set of metrics to be shown are basic quantitative data of the license texts.

The first three pairs of diagrams (fig. 1–6) show the length of license texts, measured in characters, words and sentences. As can easily be seen from these, the length of license texts varies greatly in all metrics. While more than half of the licenses are of a reasonable length, there are some that can be considered extremely long. To give a rough approximation for better understanding of these results, printed books contain between 250 and 300 words per page, while documents such as the papers on this journal have twice that amount.

Having calculated the number of characters, words, and sentences of each license text, the next step is to perform divisions of these numbers in order to calculate averages. The next two pairs of diagrams (fig. 7–10) show this metric: the average number of characters in a word and the average number of words in a sentence. This could give an indication on the complexity of the analysed text. Unfortunately, it turns out that these metrics are not useful and do not provide significant information. The average length of a word does not vary much, and all the values are consistent with reported typical values for arbitrary text written in English. Neither does the average length of sentences, measured in words, vary much – again, it is more a property of the language rather than an attribute of the specific text. There are some outliers with long sentences that appear on the right side of the graph, but these can be explained as licenses with very few – or even a single – sentence, which obviously makes the computation of an average value meaningless.

A metric more interesting than the average lengths is the computation of the maximum lengths, i.e., the longest words and sentences appearing in each license. Obviously, understanding a text presupposes understanding of even its most complex part. The results of the longest words and longest sentences are presented in the next two pairs of diagrams (fig. 11–14). Once again, the results may be somewhat misleading in some cases because of the analysis assumptions. In order to compute the length of the longest word, one has to precisely define what a “word” is. For regular English prose there are only a few decisions to be made – like the aforementioned handling of hyphenated words and counting them as one or two. However, the actual license texts often contain more than regular prose. For example, many of them contain a URL pointing to a resource location; the decision how this should be handled obviously affects the calculated final result. Even if the decision to split the URL into individual path components is taken, it is usually the case that the URL contains lengthy sequences of characters that can be considered words, resulting in a larger number for the length of the longest word.

The metrics presented till now show that even the task of reading the complete license text is, in some cases, not an easy or quick one.

Sentiment analysis

Going beyond the basic metrics of the license texts, the next step is to attempt to analyse the actual content. The last years have seen a remarkable proliferation of algorithms in order to perform

"sentiment analysis" of written text. Sentiment analysis usually computes two metrics for each text: its *polarity* and its *subjectivity*.

The polarity of a text denotes whether the text is positive, negative, or neutral.[5] It is expressed by a number between +1 (most positive) and -1 (most negative), with results close to 0 being most neutral. The polarity of all the license texts are shown in fig. 15 and 16. As can be seen, in both sets, the vast majority of license texts are neutral or slightly positive. There are few exceptions of a few texts being a little negative and a couple of outliers being extremely positive. Thinking about the license contents can provide an insight on the results: licenses usually describe rights and obligations. Such expressions can be formulated in a positive or negative structure; for example, by describing what is allowed to be done or by what is not allowed.

The subjectivity of a text denotes whether the text can be classified as subjective or objective.[6] It is expressed by a number between +1 (very subjective) and 0 (very objective). The subjectivity of all the license texts are shown in fig. 17 and 18. As can be seen, in both sets, the vast majority of license texts are mainly objective. A few exceptions exist also in this case, with some licenses being classified as extremely subjective. This is mainly due to the very small size of these license texts and the presence of words or expressions that might be considered not objective (e.g. "fair").

Linguistic information

The metrics presented above, although giving general information on the license texts, do not provide insight to how easily the license texts can be understood by the people reading them. There is a whole field of research in linguistics that tries to measure exactly this ease of understanding, named *readability* of a text.

There is a plethora of calculations that result in a single number that denotes the readability of a given text. In this paper, results are presented only for a single formula, the SMOG grade. However, the analysis has shown that the results are equivalent when other readability formulas are being used. As with all other metrics, one should be careful with the actual results, mainly because some of the license texts are very short and therefore readability metrics and formulas may not produce an accurate result.

SMOG, which stands for Simple Measure of Gobbledygook, has the advantage of presenting the readability of a text as an estimation of the years of education needed to understand it.[7] For example, a text with a SMOG grade of 6 is deemed to be fully understandable by children having completed 6 years of school.

The SMOG grade of all the license texts are shown in fig. 19 and 20. As can be seen, in both sets, the vast majority of license texts are graded between 15 and 20. A handful of exceptions also exist, with the most sensational being a license that, according to its SMOG grade, can be fully understood by people who have had almost 29 years of school!

5 Pang, Bo; Lee, Lillian; Vaithyanathan, Shivakumar (2002). "Thumbs up? Sentiment Classification using Machine Learning Techniques". *Proceedings of the Conference on Empirical Methods in Natural Language Processing (EMNLP)*. pp. 79–86.

6 Pang, Bo; Lee, Lillian (2008). "Subjectivity Detection and Opinion Identification". *Opinion Mining and Sentiment Analysis*. Now Publishers Inc.

7 McLaughlin, G. Harry (1969). "SMOG grading: A new readability formula". *Journal of Reading*, 12 (8) pp. 639–646.

Conclusion

The analysis of the language in the licences used for Free and Open Source Software shows that, despite the – stated or presumed – intent of their authors, the licences themselves are not easy reading and cannot be easily understood.

This result is also easily empirically confirmed. There is a vast amount of content available with the sole purpose of explaining the license texts; nevertheless, discussions on the very same subject keep occurring with alarming frequency.

It is reasonable to assume that the writers of these licenses have not purposefully created texts that are difficult to understand; it might even be the case that they have used the simplest possible way to express their intended meaning. However, the undeniable fact is that the current state of the license texts poses a heavy burden on the users.

The actual "cost of understanding" of a license should be always taken into account, especially when endeavouring in the process of creating a new one.

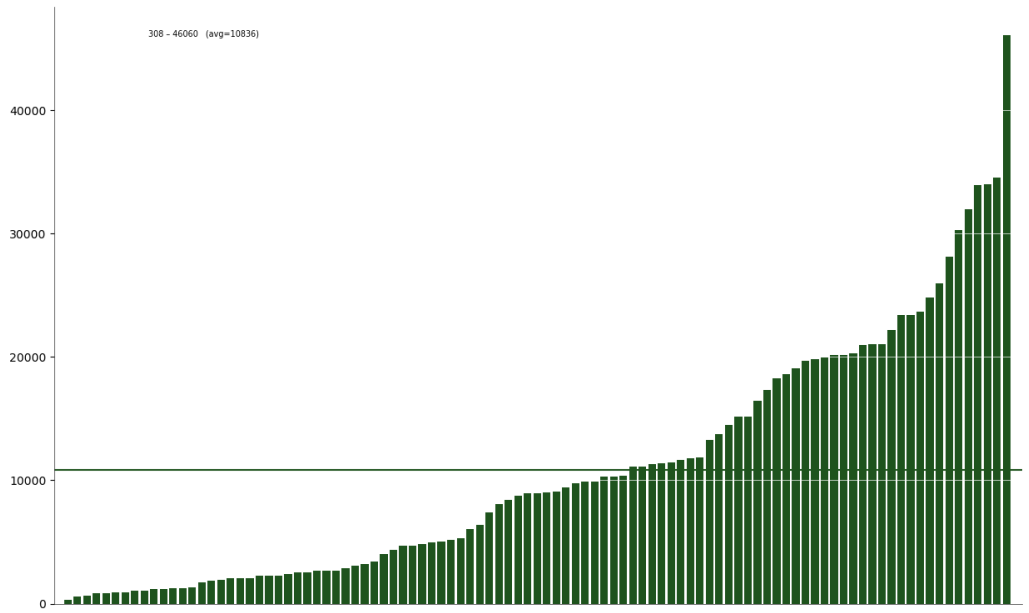

Fig. 1: Text length in characters (OSI)

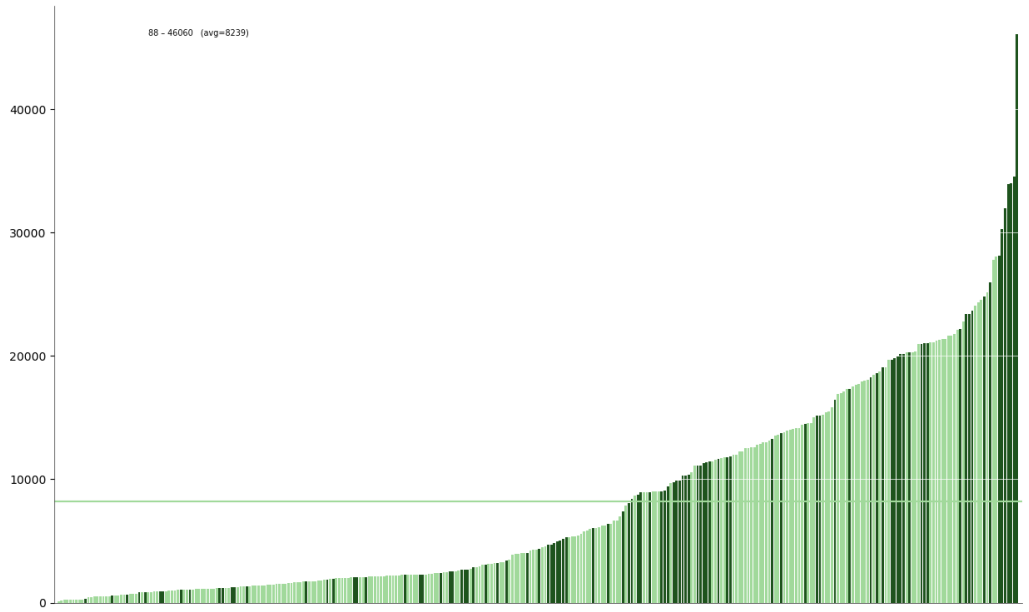

Fig. 2: Text length in characters (SPDX)

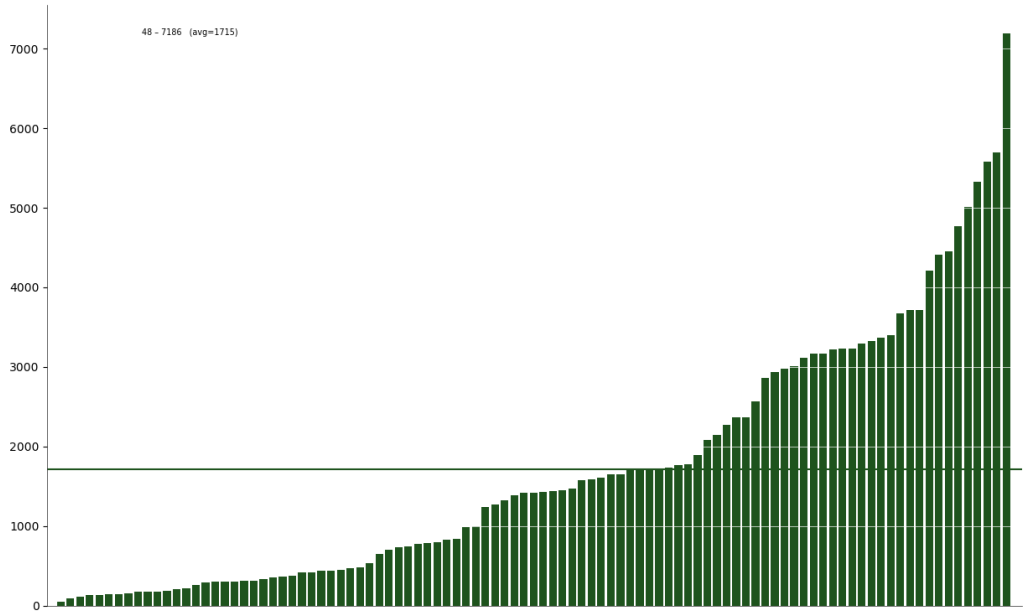

Fig. 3: Text length in words (OSI)

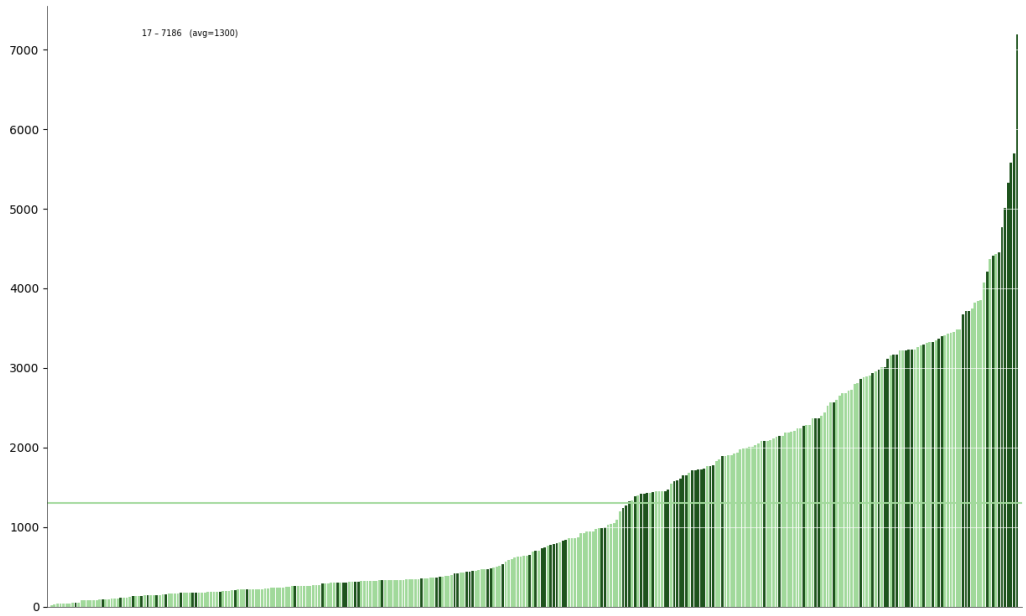

Fig. 4: Text length in words (SPDX)

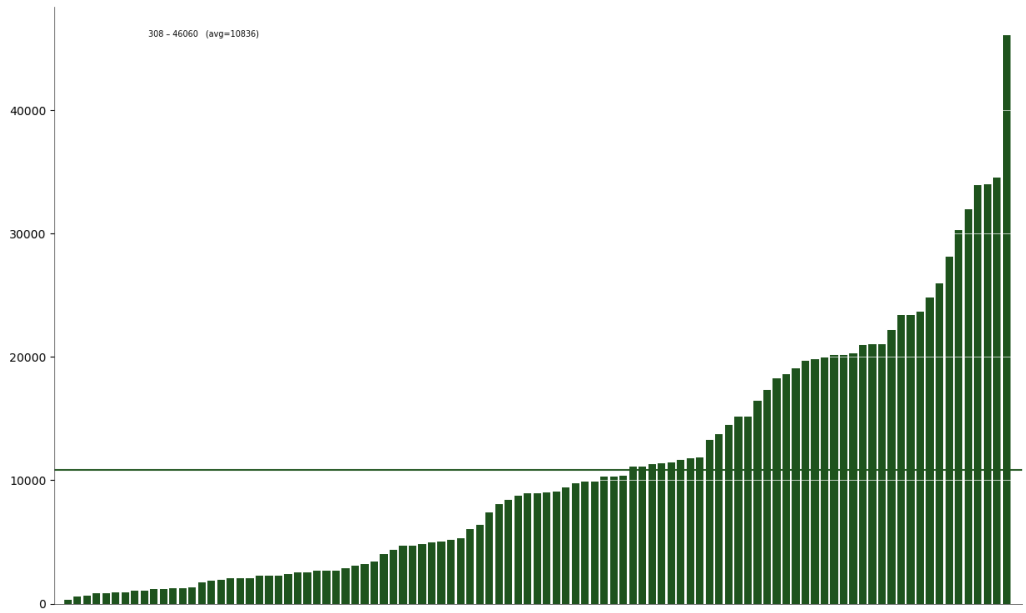

Fig. 5: Text length in sentences (OSI)

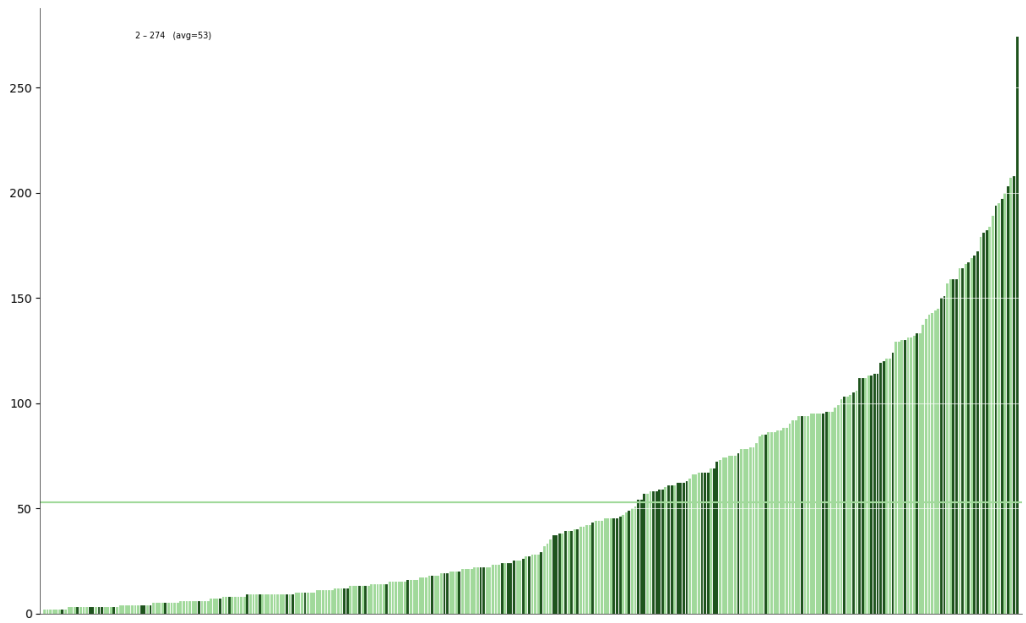

Fig. 6: Text length in sentences (SPDX)

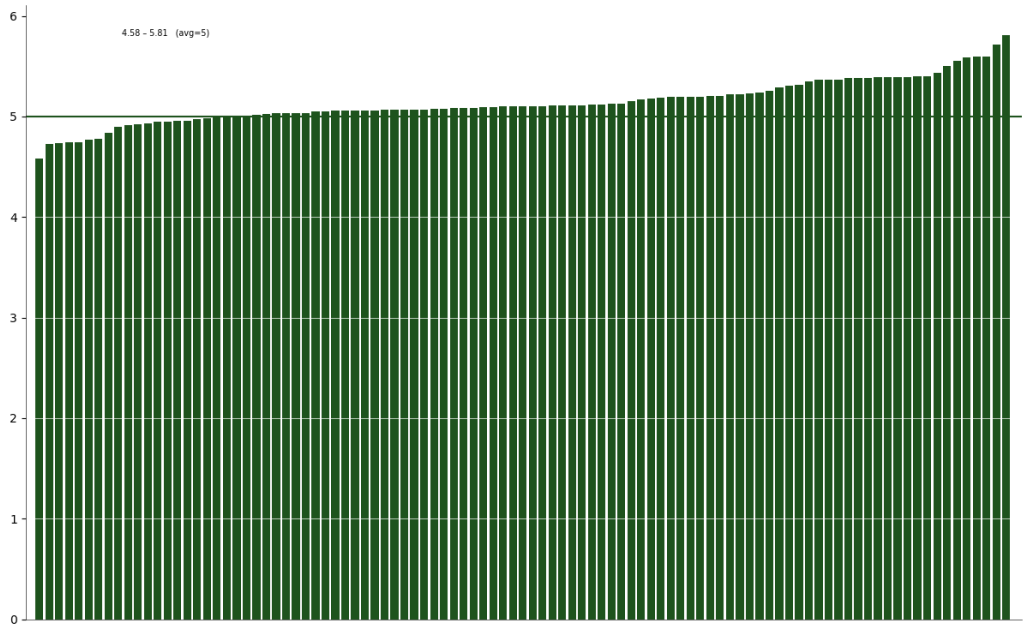

Fig. 7: Average word length in characters (OSI)

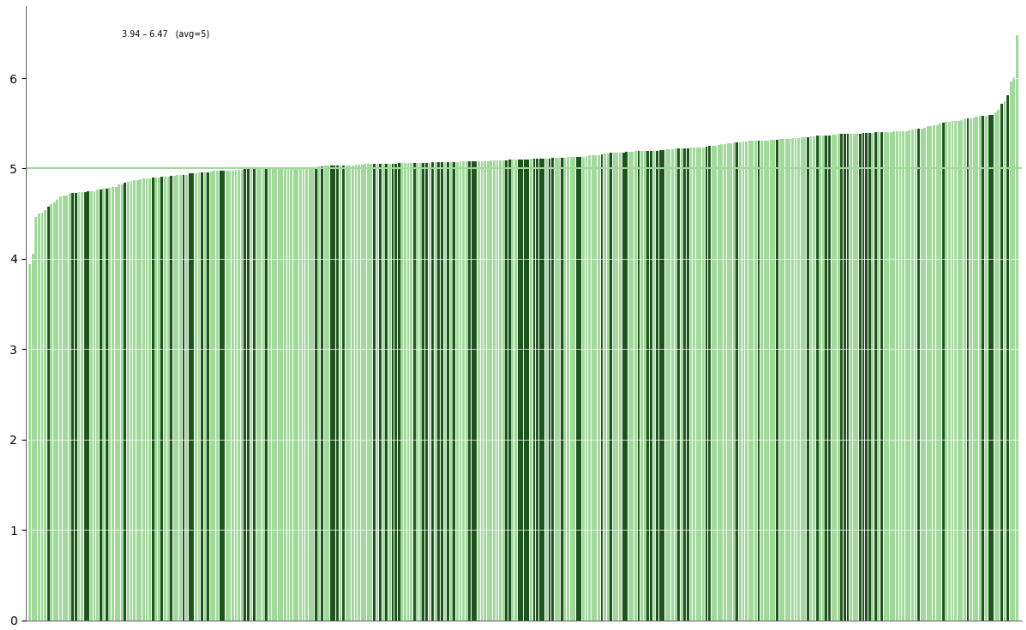

Fig. 8: Average word length in characters (SPDX)

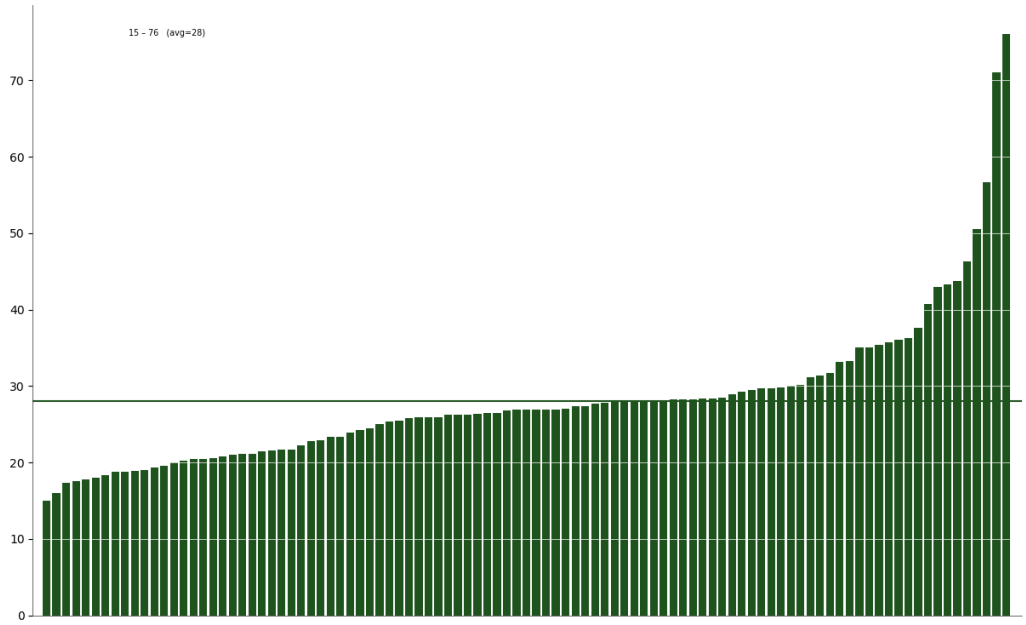

Fig. 9: Average sentence length in words (OSI)

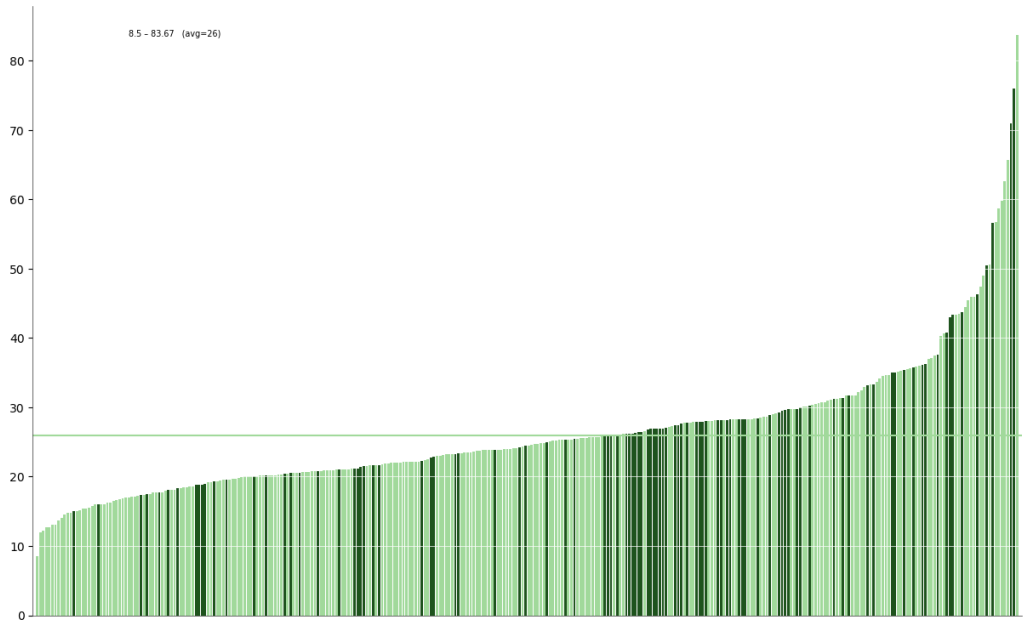

Fig. 10: Average sentence length in words (SPDX)

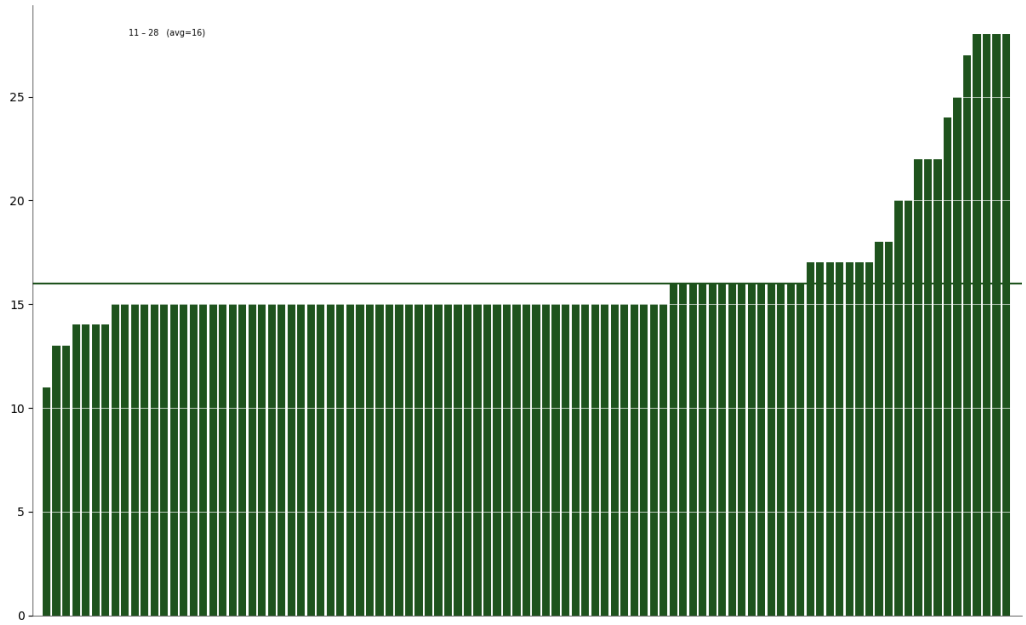

Fig. 11: Longest word in characters (OSI)

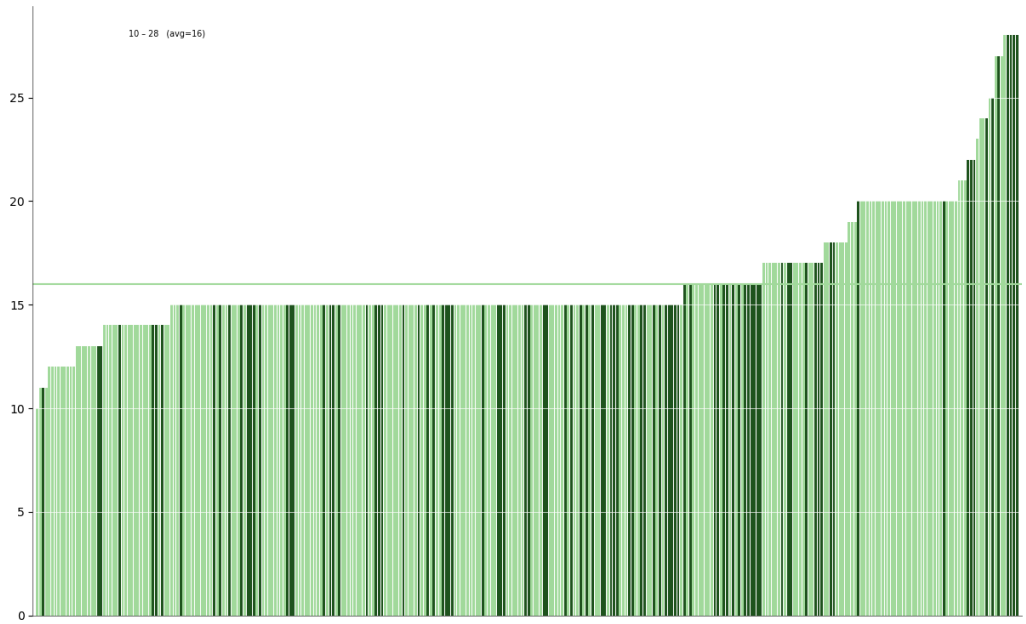

Fig. 12: Longest word in characters (SPDX)

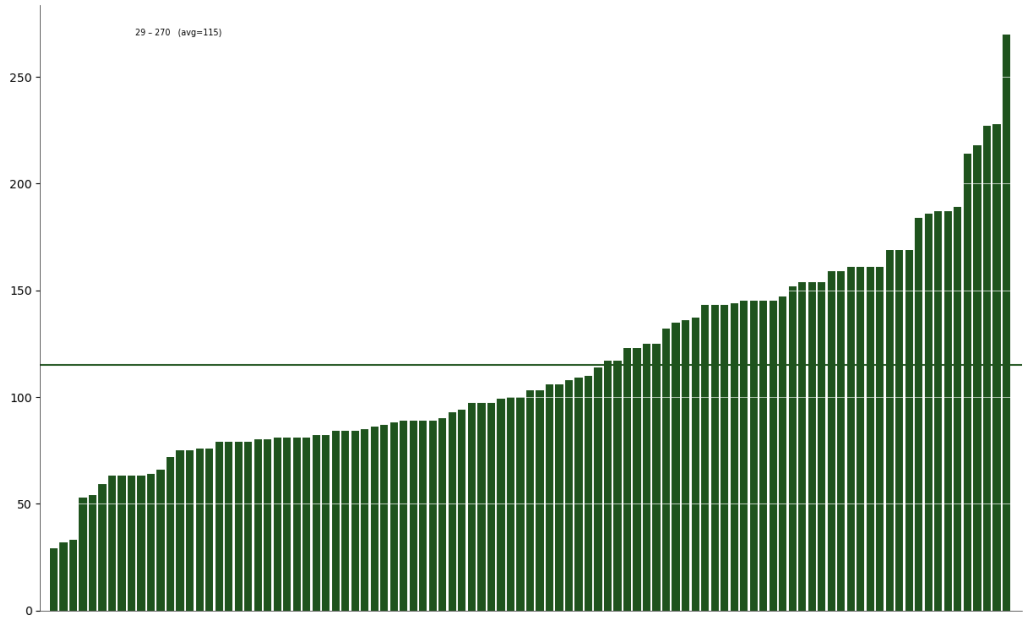

Fig. 13: Longest sentence in words (OSI)

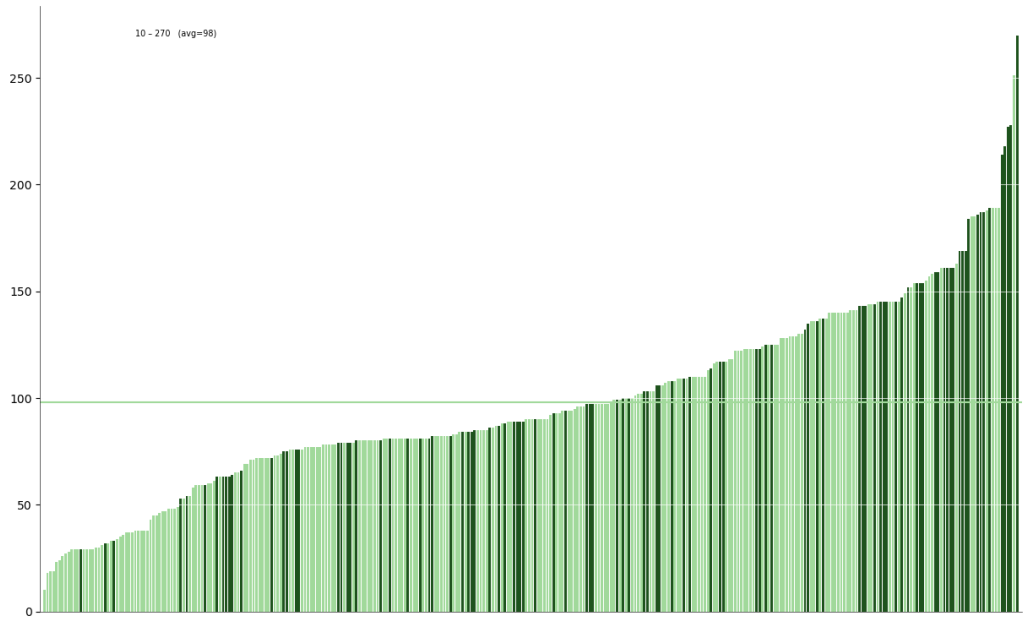

Fig. 14: Longest sentence in words (SPDX)

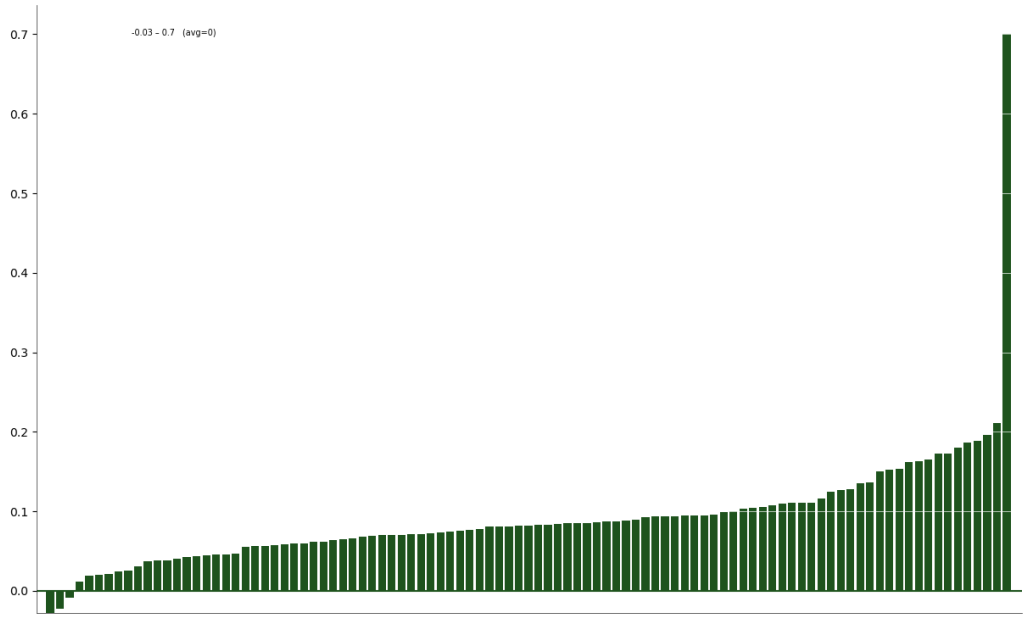

Fig. 15: Polarity of text (OSI)

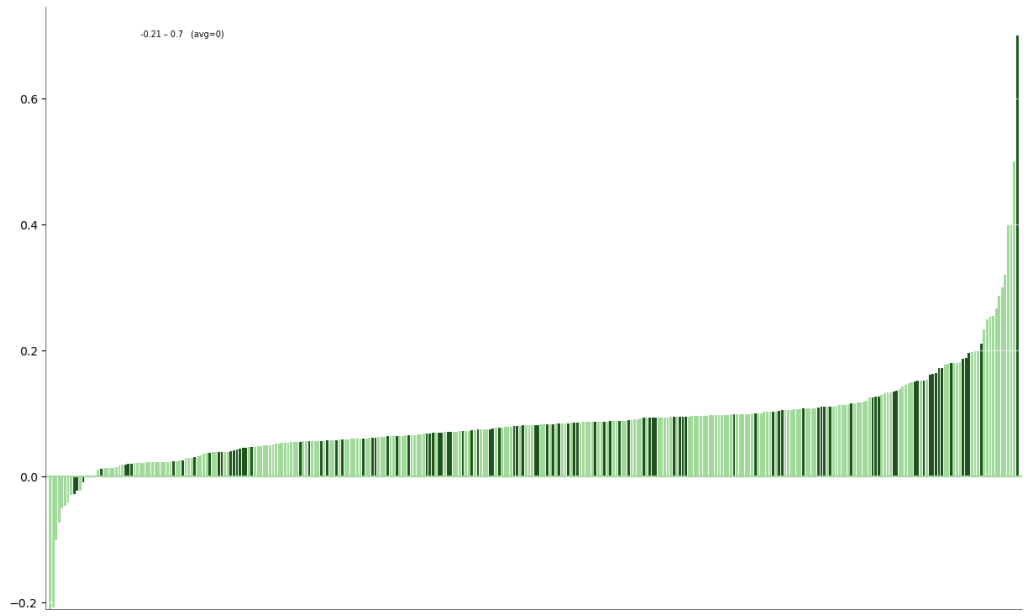

Fig. 16: Polarity of text (SPDX)

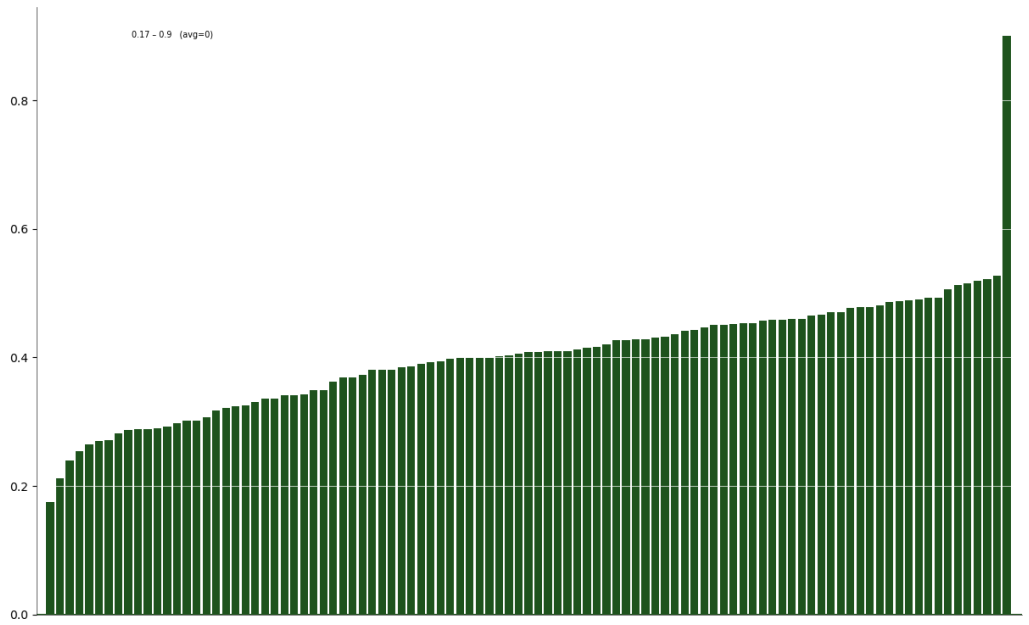

Fig. 17: Subjectivity of text (OSI)

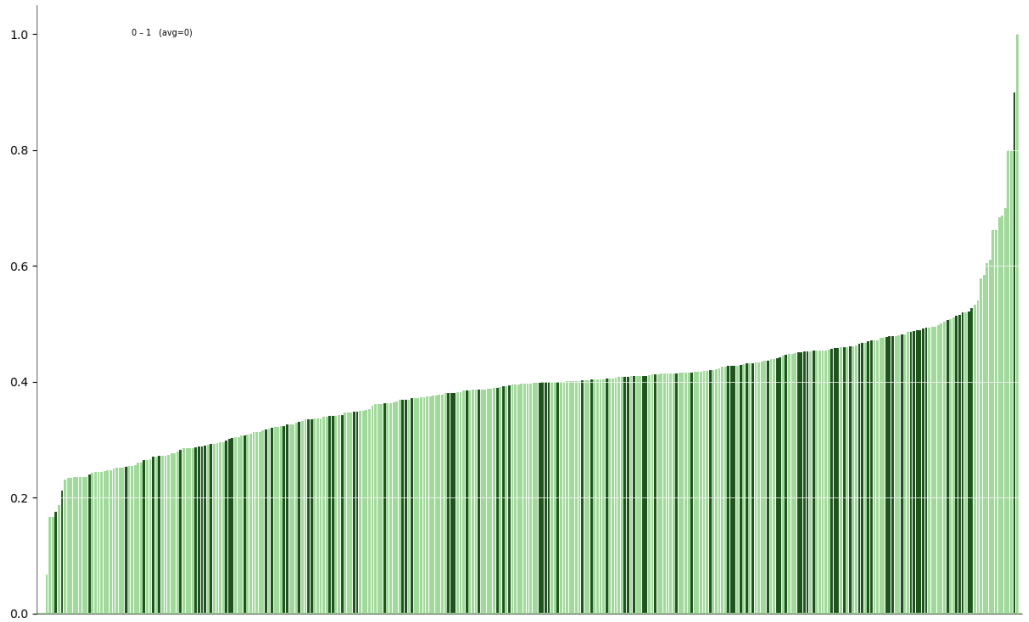

Fig. 18: Subjectivity of text (SPDX)

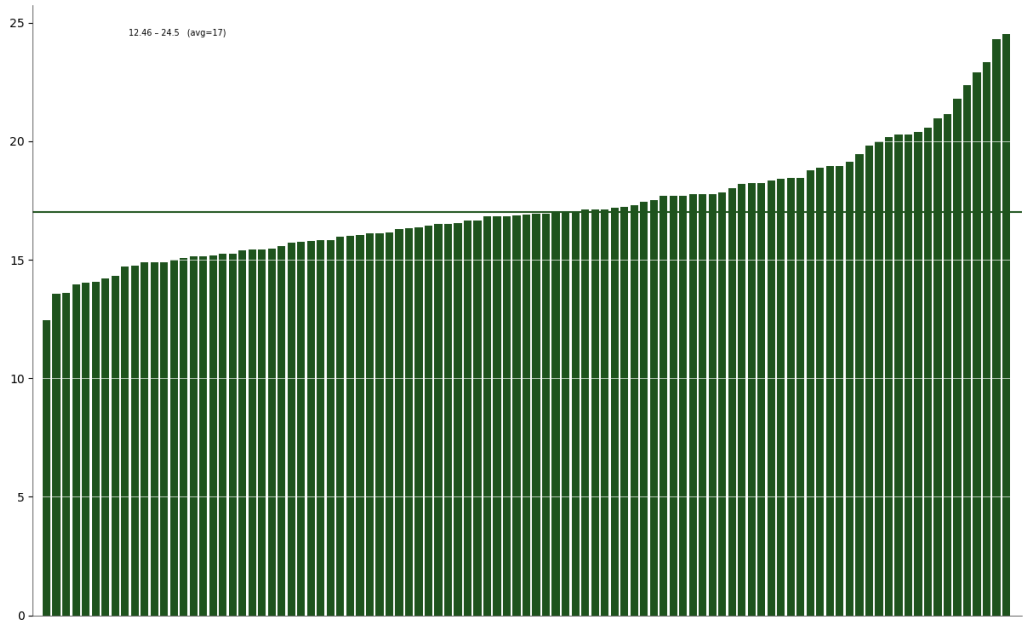

Fig. 19: SMOG readability grade (OSI)

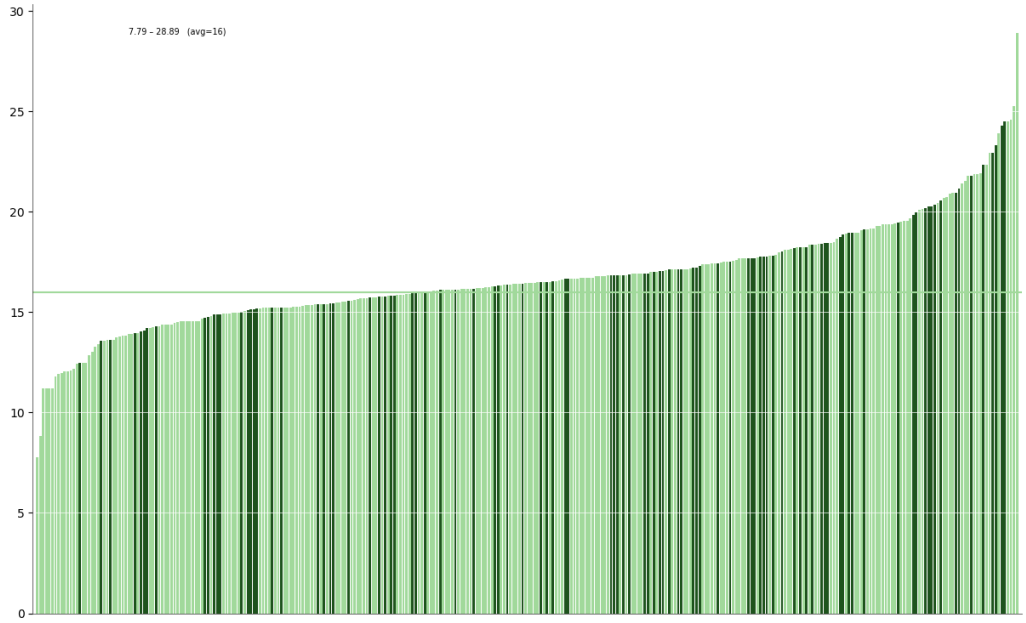

Fig. 20: SMOG readability grade (SPDX)

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The Constitutional Accountability for Open Standards

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Abstract
This article summarises a doctoral dissertation at the Faculty of Law at the University of Hamburg, Germany. The thesis has been published 2015 as part of a publication series of the Hans-Bredow-Institut, Hamburg, with NOMOS Publishing House, Baden-Baden.
The dissertation herein summarised provides a concrete legal substantiation of an accountability of the State to enact a regulatory framework which ensures vendor-independent data formats in the private market (below chapter VI-VII). As a result, this work offers the necessary objective, perspective, regulatory means and the avoidance of complex evidential problems to legally ensure interoperability in the market of telematics. In order to derive these results the economic, social and technical background as well as the actual existing influence possibilities of the State must be outlined first (chapter I-V).
Although the findings summarised here are primarily derived from German law, they are likely to be applicable to other European legislations as well due to the fact that German telecommunication law is considerably superimposed by European telecommunication law.

Keywords
Open Standards, Telecommunication Law, E-Government; Competition Law, Regulation, File Formats, Free Software

I. Definition of Problem

The transformation of a production-oriented industrial society into a knowledge-based information society already began during the 1960s. As a result, the social significance of knowledge and information has grown exponentially ever since[1]. On the technical side of transmission and archiving of information, digital systems have replaced traditional analog technologies.

This digitalisation of information technology is the most significant development in modern

1 Cf. Meier, Andreas: E-Democracy & E-Government: Entwicklungsstufen einer demokratischen Wissensgesellschaft, Berlin, Heidelberg: 2009, p. 3.

telecommunication and leads to a radical culture change[2]. The related upheavals result in impacts that are comparable to the industrial revolution[3], the invention of letterpress printing or even the introduction of written language[4]. The potential of digitisation by far exceeds the relevance of telegraph networks or modern voice telephony. In comparison with traditional analog means of communication, a new range and quality of services is accomplished by using digital technologies[5]. In particular, the convergence of classical and new services is made possible, such as film and television, written, voice, visual and other data communication. Through digital technology methods of communication that were previously separated are now converging into an all-encompassing interconnected system. By means of data transmission, individual written or verbal communication is just as realisable as a general distribution of texts, radio broadcasts or television. The boundaries between traditionally separated and new distribution paths are vanishing and the proceeding digitalisation allows that, for instance, services provided by telephone, radio, television sets or computers may no longer be rendered by separated mono-functional end-user equipment but instead by software-based multifunctional devices[6].

Older communication media used analog technologies for fixation, archiving and transmission of information. In this context the term 'analog' describes the fact that, although the different stages of transmission of information differ in some respects, they are subject to the same basic principles. For example, an analog written paper form or image recording captures the information in a directly perceivable way[7]. In case of an analog transmission of information, for example, an analog radio broadcast or telephone call, the audible sound waves and the electro-magnetic waves used for long distance transmission behave analogously to each other. While converting the sound waves into electro-magnetic waves, the basic nature of the signal does not change. This is why the process of analog fixation and transmission of information is comprehensible in itself.

In contrast to previously commonly used direct analog fixation and transmission, modern digital technology is distinguished by an abstract and indirect encoding / transmission of information, by the way of interpreting two signal statuses[8]. When using digital technology, any messages (for example graphic characters, speech or pictures) are recorded in an analog form only as a first step. Subsequently the message must be binary-encoded, thus fragmented into two signal states according to defined abstract principles[9]. The circuits that computer technology depend on are only able to provide two signal states – electricity on and off (0 and 1)[10]. The complex rules and principles which

2 European Commission, Green Paper on the Convergence of the Telecommunications, Media and Information Technology Sectors and the Implications for Regulation, December 02, 1997, p. ii, http://ec.europa.eu/archives/information_society/avpolicy/docs/library/legal/com/greenp_97_623_en.pdf.

3 Cf. European Commission, Green Paper on Convergence, ibid., p. 10; Grewlich, Klaus: Wettstreit im Regulierungsrecht der Kommunikation – Auswirkungen auf Unternehmen und Geschäftsallianzen, Kommunikation & Recht 1998, p. 523-530, p. 623 et seq..

4 Coy/Tholen, HyperKult: Geschichte, Theorie und Kontext digitaler Medien, in Brunnstein, Klaus / Oberquelle, Horst: 25 Jahre Informatik an der Universität Hamburg: Informatik: Stand, Trends, Visionen – Festkolloquium 25 Jahre Informatik an der Universität Hamburg, Hamburg: 1997, p. 81.

5 Sommer, Stephan: Staatliche Gewährleistung im Verkehrs-, Post- und Telekommunikationsbereich: zur Interpretation der Gewährleistungsnormen der Art. 87e IV und 87f I GG im System verfassungsrechtlicher Leistungspflichten, Berlin: 2000, p. 12.

6 Paschke, Marian: Medienrecht, 3rd edition, Berlin: 2009, p. 6 et seq..

7 Cf. Wolfgang Coy: Digitale Kultur - Von alten und neuen Medien, Forum Kultur im Stadthaus Ulm, Ulm, lecture on February 25, 2000, p. 4, http://waste.informatik.hu-berlin.de/Coy/Papers/Coy_Ulm_000225.pdf.

8 Cf. Fuchs, Klaus / Landgraf, Bernd: Informationsverarbeitung in der öffentlichen Verwaltung: Verwaltungsinformatik, 3rd edition, Bonn 1992, p. 13 and p. 18; Stallings, William: Data and Computer Communications, 6th edition, New Jersey: 2000, p. 132.

9 Jungheim, Stephanie: Medienordnung und Wettbewerbsrecht im Zeitalter der Digitalisierung und Globalisierung, Tübingen: 2012, p. 5.

10 Fuchs, Klaus / Landgraf, Bernd: Informationsverarbeitung in der öffentlichen Verwaltung: Verwaltungsinformatik, 3rd edition, Bonn 1992, p. 19; Stallings, William: Data and Computer Communications, 6th edition, New Jersey: 2000, p. 32.

are necessary for such an abstract encoding of information are defined by the data format used. Like compiled software code, such data formats are abstract artificial languages that must be specified by completely formal grammar and cannot be defined by their usage or context[11].

In the course of information transfer, standards of digital message encoding hold a key position. Subsequent to the necessary step of digital encoding, only those recipients will have access to digitalised information who are actually able to implement the used data format. If communication is realised by maximum integration of vendor specific encoding of information, the information flow is consequently limited to vendor specific software. Whoever controls the technology in which information is encoded, controls the access to communication and is able to determine the modalities for utilisation[12]. This particularly applies to aspects of transparency and security, which has lately been demonstrated in the context of the revelations of Edward Snowden regarding NSA.

When a technical specification exclusively offered by a single supplier has penetrated the market without any interoperable implementations on offer from a competitor, it is misleadingly spoken of as a 'proprietary standard'[13]. The establishment of a proprietary standard presupposes that the principles of a data format are kept secret and/or are protected as intangible property, and hence are not, or not completely, available to competitors and society. Strictly speaking, such proprietary standards are no standards at all, at least not in the proper sense of the word, but rather the de-facto usual that is vendor specific[14].

Examples of lacking compatibility in the course of digital information encoding are numerous and diverse. For instance, during the catastrophic flood in Southeast Asia in 2004 it was not possible to exchange documents necessary for rescue and identification of victims among governmental agencies due to vendor specific document formats[15]. The vendor specific encoding of FEMA aid online, the official governmental website for coordination of disaster relief in the USA, prevented some victims of Hurricane Katrina from registering; at first only victims using Microsoft Internet Explorer where able to sign up for governmental assistance and support[16]. Also the Live-Stream of the European Parliament available on the Internet had until recently been encoded in a vendor-specific manner and only individuals using the Windows Media Player were able to view the stream[17].

In order to allow communication, a technical process must be organised and unified. Unlike a non-grid-bound energy supply with mineral oil and coal, the communication infrastructure is a synchronised and cooperative machine[18]. Thus, for decades the telephone system was called the "biggest machine of the world"[19]. What makes a network system into a consistent machine is the successful cooperation of its individual parts. Within the modern and privatised telecommunication market, the necessary technical standardisation does not only determine the communication channels

11 Coy, Die Sprache(n) des Internets, in Panagl, Oswald / Goebl, Hans / Brix, Emil: Der Mensch und seine Sprache(n), Weimar: 2001, p. 2.
12 Cf. Recke, Martin: Medienpolitik im digitalen Zeitalter: zur Regulierung der Medien und der Telekommunikation in Deutschland, Berlin: 1998, p. 39 et seq..
13 Greve, Felix: Die staatliche Gewährleistungsverantwortung für offene Standards, Baden-Baden: 2015, p. 66 et seq..
14 Greve: ibid..
15 Cf. Berkman Center for Internet Society, Open ePolicy Group's Roadmap for Open ICT Ecosystems (September 2005), http://cyber.law.harvard.edu/epolicy/roadmap.pdf.
16 DeNardis / Eric Tam: Open Documents and Democracy, Yale Information Society Project, 2007; http://ssrn.com/abstract=1028073.
17 As at September 1, 2009, http://www.europarl.europa.eu/wps-europarl-internet/faces/live/live-video.jsp?language=de.
18 Cf. Schivelbusch, Wolfgang: Lichtblicke: zur Geschichte der künstlichen Helligkeit im 19. Jahrhundert, Frankfurt am Main: 2004, p. 34.
19 Cf. Recke, Martin: Medienpolitik im digitalen Zeitalter: zur Regulierung der Medien und der Telekommunikation in Deutschland, Berlin: 1998, p. 24.

between the individual users but it also determines whether or not competitors might have effective opportunities of accessing the market.

Nowadays, digital telecommunication not only creates the prerequisite for changed economic structures, but also for modern political systems[20]. The convergent process of digital transmission of information constitutes a key element of democratic, social and economic processes and thus is of considerable importance. Convergent transmission of digital information, its services and applications have an impact on every aspect of our lives: our home, our workplace, our access to healthcare, the economy, public services and different forms of participation in a democratic society[21].

Such a key function already made the telegraph network, and later the telephone network, into evident and undeniable objects of State interest. The same applies to the modern, digital and convergent system of telecommunication. Consequently, governments and political leaders bear a special responsibility for this fundamental infrastructure[22]. The values underlying this responsibility of the State are reflected in the German constitution[23], are to be found in several aspects of European Community law and are globally recognised as well[24]. In accordance with provisions of European law, the German federal legislator in article 87f GG (German constitution) has a statutory duty to regulate the telecommunication sector[25]. Besides that, article 5 GG[26] already sets out the Federal Republic of Germany as being a free information society. Same basic principles apply in EU law and in other member states as well[27]. Free information flow must be open for participation, thereby ensuring that nobody is excluded from the outset[28].

It is therefore not a mere technical question in which data format information is saved and exchanged, but rather a decision with great economic and social significance[29]. Consequently, the problems of vendor-specific proprietary standards for digital information encoding have been discussed for quite some time in political and expert circles worldwide. However, only sector-specific

20 Cf. Latzer, Michael: Mediamatik: die Konvergenz von Telekommunikation, Computer und Rundfunk, Opladen: 1997, p. 15.

21 Cf. European Commission, Green Paper on the Convergence of the Telecommunications, Media and Information Technology Sectors, and the Implications for Regulation, December 02, 1997, p. 10, http://ec.europa.eu/archives/information_society/avpolicy/docs/library/legal/com/greenp_97_623_en.pdf; recital (2)-(5) of the Directive 2003/98/EC of the European Parliament and of the Council of 17 November 2003 on the re-use of public sector information, amended by Directive 2013/37/EU.

22 European Commission, Green Paper on Convergence, ibid., p. iii.

23 Cf. Frühmorgen, Michael: Daseinsvorsorge und Wettbewerb im Telekommunikationsrecht: eine Untersuchung zu Kontinuität und Wandel staatlicher Verantwortung für Telekommunikation unter besonderer Berücksichtigung der TKG-Novelle 2004, Hamburg: 2007, p. 83 et seq..

24 Cf. Communication from the European Commission: Services of General Interest in Europe, KOM 2000, p. 580; Eumann, Marc: Organisationsrechtliche Probleme kommunaler Daseinsvorsorge in den Vereinigten Staaten von Amerika, Berlin: 1999, p. 47; Säcker, Franz Jürgen: Das Regulierungsrecht im Spannungsfeld von öffentlichem und privatem Recht: Zur Reform des deutschen Energie- und Telekommunikationsrechts, Archiv des öffentlichen Rechts 2005, p. 180-224, p. 180 (191).

25 Greve, Felix: Die staatliche Gewährleistungsverantwortung für offene Standards, Baden-Baden: 2015, p. 253 et seq..

26 Constitutional right to freedom of expression and information.

27 Cf. Piana, Carlo / Öberg, Ulf: Ensuring utmost transparency – Free Software and Open Standards under the Rules of Procedure of the European Parliament, International Free and Open Software Law Review, p. 11 et seq..

28 Kloepfer, Verfassungsrechtliche Grundlagen des Zugangs zu Medien- und Telekommunikationseinrichtungen, in Prütting, Hanns: Probleme des Zugangs zu den Medien und Telekommunikationseinrichtungen sowie Fragen der Zugangssicherung: Vortragsveranstaltung des Instituts für Rundfunkrecht an der Universität zu Köln vom 9. Mai 2003, München: 2003, Chapter A, I, p. 1; cf. Jungheim, Stephanie: Medienordnung und Wettbewerbsrecht im Zeitalter der Digitalisierung und Globalisierung, Tübingen: 2012, p. 35.

29 Cf. Auswärtiges Amt / Bundesministerium für Wirtschaft und Technologie / Bundesministerium des Innern / Bundesarchiv / Bundesbeauftragter für den Datenschutz und die Informationsfreiheit / Bundesamt für Sicherheit in der Informationstechnik, Initiativpapier - Offene Dokumentenaustauschformate für die Bundesverwaltung, p. 1, http://www.cio.bund.de/SharedDocs/Publikationen/DE/Architekturen-und-Standards/initiativpapier_de_download.pdf?__blob=publicationFile.

analyses have been conducted and the present topic has not been analysed in the necessary overall context. Accordingly, quite different approaches have been discussed. Where vendor-specific technologies have already been established in the market in general, the applied means to solve such interoperability problems have failed so far due to a limited perspective, the lack of regulatory procedures and ultimately the prevailing market reality.

In the course of current statutory provisions and underlying conceptual ideas that have been adapted to cover mono-functional and analog technical capabilities, the changed technical processes and potentials of digital transmission of information lead to difficulties of application and interpretation of law. Inconsistencies and significant need for clarification arise especially in relation to telecommunication, media, intellectual property and competition law, as well as the so called e-government.

II. The Relevance of Technical Standards

It is of utmost importance to understand the role of technical standards in the process of digital telecommunication[30]. Technical standards do not constitute legal rules. Usually they are compiled by non-governmental private associations or individual commercial enterprises that are neither institutionally integrated as public administration nor act as public authority. It is only in particular cases that legal rules make reference to individual technical standards so that a legal binding effect is generated. However, within the framework of transmission of digital messages, market realities and technical dependencies constitute de facto binding effects which are quite comparable to legal norms.

Complex network effects and a very effective vendor lock-in lead to a situation where only one specification for encoding of information can prevail irrespective of whether it is a vendor-specific or a vendor-neutral standard. But the degree of vendor independence / openness of the prevailing standard determines how vendor-independent, open and functional the process of digital communication is organised and whether reliable long-term archiving is possible.

Only joint and vendor-independent standards are able to provide effective possibilities of market access and bear sufficient assurance that long-term archiving will be achievable[31]. In contrast, under an established vendor-specific standard, competition is prevented[32], telecommunication capabilities are bound to an individual vendor[33], future presentation of archived information is endangered[34] and the effect of convergence is limited to the field in which the vendor who owns the proprietary standard is developing solutions[35]. Joint technical standards can therefore be desirable or threatening, depending on whose interests are being pursued[36].

Common vendor-independent standards may be formal standards, de jure standards or de facto standards. Only such joint standards at the level of encoding of digital messages will enable competition within an interconnected telecommunication market[37]. This applies on the one hand to competition in the software market, which depends on a particular standard technology, and on the

30 Cf. Aliprandi, Simone, Interoperability And Open Standards: The Key To True Openness And Innovation, International Free and Open Source Software Law Review, Vol. 3, No. 1, pp. 5-24, p. 5 et seq..
31 Greve, Felix: Die staatliche Gewährleistungsverantwortung für offene Standards, Baden-Baden: 2015, p. 41 et seq..
32 Greve: ibid., p. 45 et seq. and p. 49 et seq..
33 Greve: ibid., p. 31 et seq..
34 Greve: ibid., p. 41 et seq..
35 Greve: ibid., p. 38 et seq..
36 Updegrove, Standards Wars: Situations, Strategies, and Outcomes, in Bolin, Sherrie: Unifier or Divider?, The Standards Edge, The Bolin Group conference analysis, forthcoming, printed by Sherdian Books, p. 34.

other hand to competition among different standard technologies, which only by their interchangeability can compete on the basis of quality and not distribution.

In contrast, vendor-specific data formats put through by a market leader or monopolist are incompatible with software solutions of other vendors. Such proprietary standards hold their ground in the market quite independently of the software and the data format quality because only the combination between market-leading proprietary software and market-dominating vendor-specific data format enables information processing and communication.

As a counter-term to proprietary standards, so-called open standards[38] are demanded mostly in the field of digital encoding of messages. The extent to which the standards should be open and vendor independent in order to constitute such open standards is highly controversial. Therefore, to what extent competitors may implement open standards in a manner that is vendor-independent as well as transparent is to a large degree determined by which definition is applied and which interest group is making reference to an 'open standard'.

III. Inconsistencies of Current Telecommunication Regulation

Pursuant to European legal guidelines, the purpose of German telecommunication law is to enable effective market access opportunities in all areas of telecommunication and, additionally, to implement concrete political objectives related to public welfare into the privatised telecommunication market. Classical methods to achieve these goals are product-related regulatory instruments, such as technical standardisation.

Despite the fact that data formats are a mandatory part of any transmission of digital information, this aspect is currently largely ignored in telecommunication regulation as well as in jurisprudential discussion[39]. Whilst German telecommunication law has established a close supervision and regulation of technical standardisation between network-and-terminal-devices, as well as between network-and-network, the interoperability of terminal devices among each other (in particular the encoding of the information contained in the transmitted binary code) plays no more than a very subordinate role[40].

In large part this is due to the fact that the focus of attention traditionally lies on classical fixed-network voice telephony (by now digitalised) which presently requires no regulation at all. In this area there is currently no risk of monopolising the principles for the encoding of messages. The process of digital encoding, which is so central for the interoperability of terminal devices, is conducted in accordance with principles of a vendor-independent and royalty-free standard published

37 Cf. FLOSSPOLS (2005) Open Standards and Interoperability Report: An Economic Basis for Open Standards, Deliverable D4, MERIT, University of Maastricht, flosspols.org, p. 5 et. seq..

38 Cf. Piana, Carlo / Öberg, Ulf: Ensuring utmost transparency – Free Software and Open Standards under the Rules of Procedure of the European Parliament, International Free and Open Software Law Review, p. 32 et seq.; Dolmans, Maurits / Piana, Carlo: A Tale of Two Tragedies – A plea for open standards, p. 122 et seq.; Gandal, An Introduction to the Economics Literature on Standards Setting Organizations, in Bolin, Sherrie: The Standards Edge, Unifier or Divider?, The Bolin Group conference analysis, forthcoming, printed by Sherdian Books, p. 110; Rosen, Defining Open Standards, in Bolin: The Standards Edge, Unifier or Divider?, S. 170; Spring/Oksala, Creating Better Standards More Efficiently, in Bolin: The Standards Edge, Unifier or Divider?, p. 207; Walli, Standards and Open Source Software: Market Unifier-Except When They´re Not, in Bolin: The Standards Edge, Unifier or Divider?, p. 79.

39 Greve, Felix: Die staatliche Gewährleistungsverantwortung für offene Standards, Baden-Baden: 2015, p. 215 et seq.; cf. Heise, Michael: Das Verhältnis von Regulierung und Kartellrecht im Bereich der Netzwirtschaften, Zur Frage der Herausbildung eines eigenständigen Netzwirtschaftsrecht, Berlin: 2008, p. 41.

40 Cf. Koenig, Christian / Loetz, Sascha / Neumann, Andreas: Telekommunikationsrecht, Heidelberg: 2004, p. 35.

by the International Telecommunication Union, namely the G.711-Codec[41]. Consequently, there is currently only a need to regulate the communication interfaces between the telephone and the electronic communication network in order to protect the terminal devices market against the market dominance of the formerly state-owned network monopolist.

In some other areas of modern telecommunication, technical standards for encoding of information that currently indisputably deserve the title 'open standard' have prevailed. For example, HTML for webpages and certain versions of the PDF standard for non-editable electronic documents. These market results are in accordance with the concept which has been the basis of privatisation of former state-owned telecommunication monopolies[42].

At present, data formats are regulated as part of the telecommunication infrastructure only in the exceptional case of digital television sets with a 'classic' shape that offer the respective reception of 'classic' television. When vendor specific encoding of information threatened to monopolise the market, governmental regulation introduced joint and vendor-independent standards for data formats, cryptographic methods and even programming interfaces (API) into the private market before monopolisation could take place, i.e. vendor specific standards could be established[43]. The respective regulatory regime is required by European guidelines[44] and implemented by German telecommunication law in paragraphs 48 et seq. TKG (German Telecommunications Act).

For all other modern forms of communication, only the transmission of abstract binary code from network termination point to network termination point is ensured by regulatory means. This applies even though vendor specific technologies have for decades successfully penetrated the terminal device software market. Governmental regulatory means in place only assure that any user may connect any terminal device to electronic communication networks. However, the fact that the reproduction of information content is only possible when a specific software solution is used is not at all addressed.

It would therefore appear that outside of the transmission of 'classic' television by means of 'conventional' networks, major barriers to interoperability have been established for decades without telecommunication regulation having been taken into account at all. As far as communication is facilitated by maximum integration of vendor-specific technologies, interoperable communication and hence competition is excluded in the affected market sector. Due to network effects and vendor lock-in, consumers will be bound to the adapted vendor-specific technology[45]. Accordingly, the main objective of telecommunication regulation in respect of terminal equipment remains unfulfilled, namely to enable consumers to use the terminal device of her/his choice for communication[46].

This differentiation between telecommunication for the purpose of transmission of 'classic' television by means of 'conventional', but now digitised, television networks using terminal devices referred to

41 Greve, Felix: Die staatliche Gewährleistungsverantwortung für offene Standards, Baden-Baden: 2015, p. 392 et seq..

42 Möstl, in Maunz, Theodor / Herzog, Roman / Herdegen, Matthias: Grundgesetz Kommentar, Band VI, Loose-leaf 05.09.2013, Art. 87f Rn. 73.; Franzius, Claudio: Gewährleistung im Recht: Grundlagen eines europäischen Regelungsmodells öffentlicher Dienstleistungen, Tübingen: 2009, p. 44; Voßkuhle, Andreas: Beteiligung Privater an der Wahrnehmung öffentlicher Aufgaben und staatliche Verantwortung, Veröffentlichung der Vereinigung der Deutschen Staatsrechtslehrer 2003, p. 266 (312).

43 Greve: ibid., p. 223 et seq..

44 Cf. article. 2 lit. o) and article 18 of Directive 2002/21/EG (framework directive); annex VI of Directive 2002/22/EG (Universal Service Directive), amended by Directive 2009/136/EG.

45 Greve, Felix: Die staatliche Gewährleistungsverantwortung für offene Standards, Baden-Baden: 2015, p. 30 et seq. and p. 66 et seq..

46 Cf. recital (2) of Commission Directive 88/301/EEC of 16 May 1988 on competition in telecommunications terminal markets (the terminal Directive); recital (10) of Directive 2008/63/EG.

as 'television sets' versus any other forms of modern telecommunication cannot be justified either technically or from a legal standpoint. There are no convincing arguments why only devices sold under the denomination 'digital television sets' and no other shape factors which are equally able to receive 'classic' television by means of 'conventional' networks should be covered by the regulatory regime of paragraphs 48 et. seq. TKG and the respective European guidelines[47]. Furthermore, there is no objective reason why other devices which receive 'classic' television via the Internet (IP-TV) are not treated as 'digital television sets' as well[48]. Just as it remains unclear why digital transmission of documents via public communication networks does not need to be protected against monopolisation. These differentiations can only be explained with outdated mental models which are suited to analog, mono-functional and technically separated means of communication and cannot be perpetuated in the age of convergence[49].

These general consequences of convergence need to be separated from the question, what regulatory density may be necessary in an individual case. In this respect, differentiations might be required and appropriate. After all, the convergent telecommunication services have quite different characteristics and effects[50].

IV. Limitations of Competition Law

In view of the outlined current lack of legal telecommunication regulation in respect of existing barriers to interoperability, the question arises which control options are offered by competition law. After all, a proprietary standard[51] is equivalent to a barrier to entry for other competitors. This applies both to the software markets depending on the standard technology, as well as to the competition for the best standard technology.

However, only under very particular circumstances, proprietary standards may lead to consequences of competition law in an individual case ex post[52]. Only in the event that certain facts are to be proven and under a high degree of discretion, certain case groups may lead to an individual retrospective revision of particular market results. This is, however, of very limited practical value in a highly dynamic market of telematics[53].

It is a fact that a proprietary standard always means a barrier to entry for other competitors within a market sector, which has been monopolised by that particular proprietary technology. But it follows from the dynamic principles of competition, which have been applied as a basis for the competition law in force, that dominant positions, or even monopolies by themselves, cannot be restricted by control options of competition law. Hence, taken in isolation, a dominant position or even a

47 Greve, Felix: Die staatliche Gewährleistungsverantwortung für offene Standards, Baden-Baden: 2015, p. 231 et seq..

48 Schmits, in Säcker, Franz Jürgen: Telekommunikationsgesetz Kommentar, 3rd edition, Frankfurt am Main: 2013, § 48 Rn. 18; Holznagel, Bernd: Die TKG-Novelle 2010, Kommunikation & Recht 2010, p. 761 (767); cf. Greve: ibid., p. 234 et seq..

49 Greve: ibid., p. 243 et seq..

50 Cf. Baier, Jan: Zulassungspflicht für Web-TV? Maßgebliche Kriterien im Lichte des Rundfunkbegriffs, Computer und Recht 2008, p. 769 (773); Potthast, Klaus-Peter: Medienrechtliche Einordnung neuer Angebote über neue Übertragungswege (z.B. IP-TV, Mobil-TV etc.), Zeitschrift für Urheber- und Medienrecht 2007, p. 443 (446); cf. Greve: ibid., p. 234 et seq., p. 240 et seq. and p. 333 et seq..

51 Regarding this term: Greve: ibid., p. 66 et seq..

52 Greve: ibid., p. 169 et seq.; cf. ECJ judgement of 09.11.1983, Slg. 1983, 3461 (Michelin); ECJ judgement of 05.10. 1988, Slg. 1988, 6211 (Volvo/Veng); ECJ judgement of 10.07.1990, Slg 1990, II-309 (Tetra Pak/Commission); ECJ judgement 06.04.1995, Slg. 1995, I-743 (Magill); ECJ judgement of 29.04.2004, Slg. 2004, I-5039 (IMS Health)ECJ judgement of 17.09.2007, T-201/04 (Microsoft/Commission).

53 Greve: ibid., p. 336 et seq..

monopoly as well as a vendor-specific proprietary standard does not violate competition law at all[54]. Rather, from this viewpoint, the tendencies towards monopoly in the telematics sector associated with network effects, by themselves, must be seen as a process which cannot be intervened by competition law[55]. Especially in markets in which network effects are highly effective and only one technical standard may survive, an embittered struggle for the greatest possible market share is part of functioning competition for the market and does not lead per se to competition law concerns[56]. Considered by itself from the point of view of competition law, it is irrelevant whether a proprietary standard, de facto standard, formal standard or even an open standard prevails.

V. Overstrained E-government

Today, the issue of lacking common technical standards for digital encoding of messages and the question which requirements should be fulfilled by such common standards, are primarily discussed in connection with e-government initiatives. After all, e-government as a future model is subject to the prerequisite of an interoperable telecommunication infrastructure. In particular, without open standards for the digital encoding of messages, central challenges of e-government remain unresolvable[57].

However, only the omission of regulation by telecommunication law has led to the current situation that interoperability of data formats is primarily discussed as a prerequisite of a functioning e-government. Instead, in connection with the regulation of the technical telecommunication infrastructure, solution approaches are currently being discussed in the context of the type of content that is being transported by the telecommunication infrastructure. This leads to serious problems because a general vendor dependence in the telecommunication infrastructure cannot be efficiently solved by specifying technical standards for individual governmental services.

Information campaigns and political decisions on principles, both internationally and in Germany, advocate the use of open standards in e-government. Primarily this is substantiated by the factual positive effects caused by the use of vendor-independent standards. However, it has not been successful to derive this requirement from concrete legal grounds; instead the respective reasoning confines itself to a mere reference to the principle of democracy and freedom of speech[58]. In accordance with the current legal situation, the primary aim of a particular e-government service remains to reach as many communication partners as possible and to enable respective up- and downstream data processing[59].

Moreover, e-government as a communication service can only have an indirect impact on the privatised market by selective procurement[60]. If, however, a software has established itself in the market, and this software exclusively supports vendor specific encoding error-free, only a fraction of the population may be reached by solutions from other software providers - even if these solutions use data formats which are indeed vendor independent and hence interoperable. Ultimately, a market leader, who has successfully established a proprietary standard, has no interest in implementing a

54 Greve: ibid., p. 169 et seq..
55 Greve: ibid..
56 Wolf, Gunnar: Kartellrechtliche Grenzen von Produktinnovationen, Lehren aus den Verfahren gegen IBM und Microsoft für die Anwendung des Kartellrechts in Hochtechnologiemärkten, Baden-Baden: 2004, p. 158.
57 Greve, Felix: Die staatliche Gewährleistungsverantwortung für offene Standards, Baden-Baden: 2015, p. 162 et seq..
58 One of the more ambitious substantiations has been attempted by Laura DeNardis / Eric Tam: Open Documents and Democracy, Yale Information Society Project, 2007; http://ssrn.com/abstract=1028073.
59 Greve, Felix: Die staatliche Gewährleistungsverantwortung für offene Standards, Baden-Baden: 2015, p. 132 et seq..
60 Greve: ibid., p. 348 et seq..

vendor-independent standard in a fully interoperable manner[61]. Therefore, a significant influence on the market will probably not be exerted. Under such conditions an exclusive use of open standards may in fact lead to failure or at least to a reduced acceptance of the e-government service in question.

Nevertheless, there are several pilot projects and concrete decisions of the German administration, which use and advocate open standards despite established vendor-specific technologies[62]. Internationally there are also numerous migration attempts. However, governmental agencies are caught in a predicament: on the one hand open standards are essential prerequisites for e-government services and moreover are socially desirable. On the other hand the main goal of an e-government service is to reach as many citizens as possible[63]. As a result of this problematic situation, where there is a market dominating proprietary standard, as a general rule, governmental authorities exclusively support the proprietary standard and, at best, implement a dual solution, thereby supporting the use of the proprietary standard and, as an alternative, an open standard that has not been established in the market. But there are substantial concerns about the practicality and the prospect of success of such a dual strategy[64]. Another approach is simply attempting to avoid monopolised channels of telecommunication and thus circumventing the problem of vendor lock-in instead of solving it.

Ultimately, in contrast to the various stated intentions and decisions of principle in which open standards are demanded, concrete technical e-government services currently rather depend on vendor-specific proprietary standards established in the market. Instead of opposing private monopolisations, the State submits to an existing market failure.

VI. The Constitutional Obligation for Open Standards

Given the current limitation of telecommunication law regulation, the limited perspective of competition law and the powerlessness of e-government initiatives, the further conclusions of the dissertation herein summarised are becoming highly relevant. Under a thorough analysis, it becomes apparent that an accountability of the federal legislator for open standards regarding digital encoding of information is an inevitable consequence of governmental obligations with respect to the telecommunication infrastructure stipulated in article 87f GG (German constitution)[65]. This accountability necessarily refers to the entire telecommunication market, including any innovations and modern technologies[66].

Proprietary standards on the level of encoding of information deprive the privatisation of the telecommunication sector of justification. Only if effective opportunities of market access actually exist, it may be expected that the intended increase of efficiency and the allocation effects optimising the common good can take effect[67]. Therefore, the federal legislator is being obligated in article 87f Abs. 2 S. 1 GG to continuously guarantee effective opportunities of market access, in order to enable the envisaged effects of the private market. In the area of telematics, interoperability and opportunities of market access are synonymous with vendor independent standards[68]. In contrast, the establishment of a proprietary standard is synonymous with a structural barrier to entry which

61 Greve: ibid., p. 50 et seq..
62 Greve: ibid., p. 154 et seq..
63 Cf. Piana, Carlo / Öberg, Ulf: Ensuring utmost transparency – Free Software and Open Standards under the Rules of Procedure of the European Parliament, International Free and Open Software Law Review, p. 30 et seq..
64 Greve: ibid., p. 155 et seq..
65 Greve: ibid., p. 311 et seq..
66 Greve: ibid., p. 285 et seq. and p. 311 et seq..

prevents competition.

Private economic competition in the telecommunications sector has been permitted only under the condition that effective opportunities of market access are created, as well as maintained, and competitors remain bound to a special social responsibility[69]. After implementation of a vendor-specific proprietary standard, it is not to be expected that such a monopolised private market sector will be better suited than a single state-owned public enterprise to enable the potential for innovation of digital technology. In consequence of an established proprietary standard, and hence under absence of competition, it is left to the sole discretion of the private monopolist how and to what extent the former state-run service of general interest is fulfilled. In contrast to a state-owned monopolist, a private monopolist is not bound by administrative guidelines, fundamental rights of the population, national objectives, let alone the common good. Therefore, in such a market situation, it must be assumed that the privatised market is even less efficient for determining and fulfilling the common good than the state-owned monopoly ever was.

The concept of privatisation does not primarily call for individual standards developed or stipulated by the government as far as a market failure is ascertained. Telecommunication regulations must take into account that the affected markets are to a high degree dependent on technical aspects affected by enormous, barely assessable developments[70]. In consequence, the federal legislator primarily needs to establish relevant mandatory requirements in the context of which private competitors may develop individual technical standards and solutions. Structural barriers to competition must be dissolved but market results should not be anticipated. In contrast to such regulation of market structure, e-government services must elect particular technologies. This leads to major difficulties where a solution that does not dominate the market is chosen.

In the regulatory environment of digital television (paragraphs 48 et seq. TKG and the respective European legal guidelines), all competitors regardless of a dominating position are committed to implement technical standards in compliance with certain minimum requirements[71]. Thus, the government provides a legal framework which ensures effective opportunities of market access and moreover implements the ideas of state welfare that have been democratically determined. Within this regulated market structure, private subjects define the technical details by standardisation of individual specifications. However, it should be clarified that the governmental responsibility for open standards does not necessarily preclude vendor specific and exclusive technologies. Rather, individual companies might very well continue to implement their more or less vendor-specific technologies but, besides these, they must also implement an open standard completely and operationally.

The globalisation of the information technology sector does not make an European or national

67 Benz, in König, Klaus / Benz, Angelika: Privatisierung und staatliche Regulierung, Bahn, Post und Telekommunikation, Rundfunk, Baden-Baden: 1997, p. 294 and p. 338; Benz: Veränderung staatlicher Aufgabenwahrnehmung durch Privatisierung – das Beispiel Telekommunikation, in Gusy, Christoph: Privatisierung von Staatsaufgaben: Kriterien – Grenzen – Folgen, Baden-Baden: 1998, p. 153; Broemel, Roland: Strategisches Verhalten in der Regulierung – zur Herausbildung eines Marktgewährleistungsrechts in den Netzwirtschaften, Tübingen: 2010, p. 145; Grande, Privatisierung und Regulierung aus politikwissenschaftlicher Sicht, in Gusy, Christoph: Privatisierung von Staatsaufgaben: Kriterien – Grenzen – Folgen, Baden-Baden: 1998, p. 44; König: in idem, Privatisierung und staatliche Regulierung, p. 69-70; Potacs, Michael: Herstellung von Wettbewerb als Verwaltungsaufgabe, Veröffentlichung der Vereinigung der Deutschen Staatsrechtslehrer 69 (2010), p. 254 (260).

68 Greve, Felix: Die staatliche Gewährleistungsverantwortung für offene Standards, Baden-Baden: 2015, p. 22 et seq..

69 Möstl, in Maunz, Theordor / Herzog, Roman / Herdegen, Matthias: Grundgesetz Kommentar, Band IV: Art. 86-106b, München: loose-leaf-collection, 68. supplement 2013, Art. 87f Rn. 40; cf. Greve: ibid., p. 264 et seq., and p. 271 et seq..

70 Benz in König, Klaus / Benz, Angelika: Privatisierung und staatliche Regulierung, Bahn, Post und Telekommunikation, Rundfunk, Baden-Baden: 1997, p. 344.

71 Greve, Felix: Die staatliche Gewährleistungsverantwortung für offene Standards, Baden-Baden: 2015, p. 223 et seq..

process of standardisation superfluous. The slow adjustment of international structures to changed power relations in the telecommunication sector in fact leads to an increasing importance of regional standardisation[72]. However, the consequence of international dimension is that worldwide processes of development and global interests must be taken into account[73].

In the future, it will become more and more relevant that the governmental responsibility for vendor-independent standards not only refers to communication between person and person as well as person and machine, but also increasingly to communication between machine and machine.

VII. Consequences

The German federal legislator is therefore obligated under article 87f GG to provide a regulatory framework which ensures vendor-independent data formats in the privatised market. To fulfil this accountability and thereby solve the problem of lacking interoperability, it is advisable to choose regulatory means provided by sector-specific and hence the most appropriate telecommunication law[74]. After all, this area of law has the objective to fulfil the governmental responsibility regarding the telecommunication sector in a privatised market. Therefore, adjusted regulatory instruments are provided to enable competition in a complex network economy and moreover to achieve certain politically intended public interests. Telecommunication law offers the necessary objective, perspective, regulatory means and the avoidance of complex evidential problems to ensure interoperability in the market of telematics.

The federal legislator within its margin of discretion may choose other means to fulfil its accountability instead of enacting telecommunication law. For example, it may choose to adapt the regulations of competition law and/or certain e-government initiatives[75]. The exact manner in which the legislator fulfils its constitutional mandate is largely left to its discretion. However, the measures taken and laws enacted must neither be counterproductive nor absolutely inadequate to achieve the protection objectives[76]. In particular, the federal legislator cannot continue to simply ignore its constitutional obligation, as it has been doing so far.

From the particular perspective of the constitutional obligation regarding the telecommunication sector, a special situation arises in respect of the general need for standardisation. In general, it is not the objective of technical standardisation to fulfil governmental accountability or necessarily to enable effective opportunities of market access, but it is rather about the sole technical, economical or even the more restricted point of view of competition law[77]. In the course of the constitutional accountability for the telecommunication sector, effective opportunities of market access must be enabled and particular interests of public welfare - which are to be defined in a democratic process - need to be ensured.

The degree of openness or vendor independence of mandatory standards to be defined is of crucial

72 Schultheiß, Kerstin: Europäische Telekommunikationsstandardisierung, eine normative Betrachtung, Münster: 2004, p. 124.
73 Schultheiß: ibid..
74 Greve, Felix: Die staatliche Gewährleistungsverantwortung für offene Standards, Baden-Baden: 2015, p. 333 et seq..
75 Cf. Greve: ibid., p. 348 et seq..
76 Stern, Klaus: Postreform zwischen Privatisierung und Infrastrukturgewährleistung, Deutsches Verwaltungsblatt 1997, p. 309 (314); Voßkuhle, Andreas: Beteiligung Privater an der Wahrnehmung öffentlicher Aufgaben und staatliche Verantwortung, Veröffentlichungen der Vereinigung der Deutschen Staatsrechtslehrer 2003, p. 267 (298).
77 Greve, Felix: Die staatliche Gewährleistungsverantwortung für offene Standards, Baden-Baden: 2015, p. 169 et seq. and p. 276 et seq..

importance. An open standard may have equal or at least very similar effects as a vendor-specific proprietary standard, depending on the definition and technical design. Therefore, even a specification referred to as an open standard may exclude, restrict or distort effective opportunities of market access and interoperability. Depending on the definition, open standards advertised to solve lacking interoperability may in fact become the cause of the problem instead of the solution.

With respect to the telecommunication regulation of digital television in paragraphs 48 et seq. TKG, technical specifications are treated as open standards when they are licensed under so-called (F)RAND terms[78]. However, it may be reasonably arguable that in general (F)RAND terms are in compliance with the ex-post evaluation of competition law[79]. From the special perspective of constitutional accountability for open standards it becomes obvious that (F)RAND terms are not suitable to provide the necessary ex-ante market structure regulation[80]. The minimum requirement of a (F)RAND license is neither able to guarantee certain public interests nor effective opportunities of market access for competitors. In particular, it needs to be taken into account that Free Software[81] is excluded from implementing (F)RAND licensed standards due to the recurring licence fees per utilisation and area of application[82].

Following a thorough analysis, the constitutional accountability for open standards in article 87f GG requires at least a royalty-free form of licensing. Although, under a royalty-free license[83] it remains undetermined as well, which particular licence conditions may be demanded in an individual case. Royalty-free does not mean that the licensing is free of charge or additional restrictions. But in contrast to (F)RAND terms, the clear exclusion of recurring royalties leads to a higher degree of legal certainty regarding the future potential for implementing a common standard. This thereby considerably reduces the legal uncertainty which arises in connection with the legality of individual license conditions[84]. Thus, for instance, under a royalty-free license, implementations of the specification and, therefore, opportunities of market access are permitted regardless of the individual software license or business model[85]. Under a respective political decision, there are good reasons to go even farther and demand licence terms comparable with Free Software licences for open standards[86].

However, as long as the accountability for market structure regulation in favour of vendor independent standards is not recognised, all future visions of the digital age are threatened to fail. Without the implementation of open standards, no interoperable information transmission and, therefore, in particular, no e-government, no paperless office and no electronic legal transaction will be feasible to the extent that has been promised for decades with tiresome regularity.

78 Regarding this type of licence: Greve: ibid., p. 84 et seq..
79 Greve: ibid., p. 169 et seq.; cf. ECJ judgement of 17.09.2007, T-201/04; (Microsoft/Commission); ECJ judgement of 27.06.2012, T-167/08 (Microsoft/Commission); Landgericht (district court) Düsseldorf, 4b O 274/10.
80 Greve: ibid., p. 318 et seq. and p. 327 et seq..
81 Greve: ibid., p. 110 et seq..
82 Greve: ibid., p. 84 et seq..
83 Regarding this type of licence: Greve: ibid., p. 89 et seq..
84 Greve: ibid., p. 91.
85 Greve: ibid., p. 314 et seq..
86 Greve: ibid., p. 314 et seq..

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Seven Notable Legal Developments In Open Source In 2016

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Abstract
Several noteworthy open source-related legal developments took place in 2016.† These concerned the fair use trial in *Oracle v. Google*, the reaction to the GPL enforcement lawsuits of Patrick McHardy, the dismissal of the *Hellwig* case, the U.S. Federal Source Code Policy, the end of Eben Moglen's tenure as Free Software Foundation general counsel, the distribution of ZFS by Linux distributions, and the banning of the JSON license by the Apache Software Foundation.

Keywords
Law; information technology; Free and Open Source Software; Developments;

A number of interesting and notable legal developments in open source took place in 2016. The following seven stories stood out:

1. Victory for Google on fair use in *Oracle v. Google*

In 2012 the jury in the first *Oracle v. Google* trial found that Google's inclusion of Java core library APIs in Android infringed Oracle's copyright. The district court overturned[1] the verdict, holding that the APIs as such were not copyrightable (either as individual method declarations or their "structure, sequence and organization" [SSO]). The Court of Appeals for the Federal Circuit, applying 9th Circuit law, reversed[2], holding that the "declaring code and the [SSO] of the 37 Java API packages are entitled to copyright protection." The U.S. Supreme Court declined to review the case, and in 2016 a closely watched second trial was held on Google's defence of fair use. In May 2016 the jury returned a unanimous verdict in favour of Google.

† This article was first published as a blog post at https://opensource.com/article/17/1/yearbook-7-notable-legal-developments-2016. The version published in this review is modified to correct format and typographical issues.

1 https://opensource.com/law/12/6/oracle-v-google-and-api-copyrightability

2 http://www.cafc.uscourts.gov/content/oracle-america-inc-v-google-inc-opinion

As Jeffrey Kaufman explains[3], the verdict does not change the appellate ruling concerning API copyrightability, which, however, has limited precedential significance. Fair use involves a highly fact-specific determination, and the verdict has no obvious broader legal significance. Nonetheless the result was a clear victory for Google. Oracle has filed an appeal.

Although *Oracle v. Google* is not a "case about open source" per se, it is notable that both sides are stewards of relevant open source platforms centred around Java development. Oracle leads the OpenJDK project, in which the APIs at issue in this case, if we regard them as copyrightable, are licensed under GPLv2 along with the Classpath Exception[4]. The Android platform, which does not implement all Java core library APIs, is licensed mostly under the Apache License 2.0. Its Java core library API implementations were generally taken from the Apache Harmony[5] project, which began as a pre-OpenJDK effort to develop an open source Java runtime. Late last year Google confirmed[6] that Android Nougat would use GPL-licensed[7] class library code from OpenJDK in place of the Apache Harmony code.

2. Censure of Patrick McHardy

Since 2014 there have been rumours of GPL enforcement lawsuits being brought against many companies in Germany by Patrick McHardy, a Linux kernel developer who was formerly the chair of the Netfilter[8] core team. There is some discussion of the McHardy litigation in a recent Black Duck/DLA Piper slide deck[9].

Until 2016 there had been something of a taboo on open discussion of the McHardy lawsuits. This ended on July 18th, when the Netfilter project announced[10] that it would "suspend" McHardy from the Netfilter core team, the first such action it had ever taken, because "severe allegations have been brought forward against the style of his license enforcement activities." Although the core team had no first-hand evidence for the allegations, which were consistent and came from "trusted sources," they noted that despite many attempts to reach McHardy he did not respond. The announcement was made in the name of the core team members, including emeritus member Harald Welte, who is well known for bringing a series of successful GPL enforcement lawsuits in Germany.

A few weeks earlier, the Netfilter core team published a statement[11] officially endorsing the Principles of Community-Oriented GPL Enforcement[12], which were released by the Software Freedom Conservancy and the Free Software Foundation in 2015. The core team stated that "license enforcement is a necessary tool to ensure all parties adhere to the same set of fair rules as set forth by the license," but then, presumably alluding to McHardy, declared that "any enforcement action should always be focused on compliance, never prioritize financial gain, never settle for less than compliance and consider legal action in court only as a last resort." In the July 18th announcement of McHardy's suspension, the core team said that McHardy "continues to be welcome in the project as soon as he is able to address the allegations and/or co-sign the [Conservancy/FSF Principles] in terms

3 https://opensource.com/law/16/6/outcome-google-v-oracle-good-open-source
4 http://openjdk.java.net/legal/gplv2+ce.html
5 https://harmony.apache.org/
6 http://venturebeat.com/2015/12/29/google-confirms-next-android-version-wont-use-oracles-proprietary-java-apis/
7 https://android.googlesource.com/platform/libcore/+/29c2a3a52980b18ab26f860e9cc712487881b081%5E%21/#F0
8 http://netfilter.org/
9 http://www.slideshare.net/blackducksoftware/litigation-and-compliance-in-the-open-source-ecosystem
10 https://marc.info/?l=netfilter-devel&m=146887464512702
11 https://www.netfilter.org/files/statement.pdf
12 https://sfconservancy.org/copyleft-compliance/principles.html

of any future enforcement activities."

The next day, Karen Sandler and Bradley Kuhn of the Software Freedom Conservancy published a blog post[13] addressing the subject of McHardy. They revealed that Conservancy had engaged in largely unsuccessful attempted communications with McHardy for two years. Conservancy encouraged McHardy to co-draft the Principles with them and later invited him to endorse the Principles after they were published, but received no response from him. Sandler and Kuhn denounced McHardy for apparently refusing to endorse the Principles and failing to publicly justify his conduct of GPL enforcement.

3. Hellwig lawsuit dismissed

In 2015 Linux kernel developer Christoph Hellwig brought a copyright infringement suit against VMware in a German district court, alleging violation of the GPL in VMware's ESXi product. Hellwig's legal expenses were funded by the Software Freedom Conservancy. The Hellwig lawsuit attracted significant attention because it is apparently the first litigated GPL compliance case that centres on the scope of the GPL's copyleft requirement, sometimes thought of as the "derivative work" issue.

In July 2016, as Scott Peterson has reported[14], the court dismissed the case, concluding that Hellwig had failed to identify in the VMware product the specific lines of code in which he owned copyright. The court discussed the GPL issue, but it did not address the merits. The ruling has no precedential significance for other cases. In a brief statement, Hellwig announced that he would appeal the ruling.

4. U.S. government announces Federal Source Code Policy

In August the U.S. government's Office of Management and Budget announced the Federal Source Code Policy[15]. The policy is aimed at reducing the problem of duplicative acquisition of substantially similar code by agencies and ensuring that new custom-developed federal source code be made broadly available for reuse across the federal government. Mark Bohannon has written an article[16] on the policy.

The Federal Source Code Policy establishes a three-year pilot program that requires agencies (with some exclusions) to release at least 20% of new custom-developed software as open source each year. The policy recognizes open source as a means of enabling continual improvement resulting from improvements to the software by the broader community. The policy also announced the launch of code.gov[17], a "discoverability portal" for custom-developed code, including code released as open source under the policy.

The Federal Source Code Policy is notable for placing emphasis on adhering to proper standards for open development as well as open source licensing. Agencies releasing open source code are directed to do so in a manner that encourages engagement with existing communities, fosters growth of new communities, and facilitates contribution both by the community to the federal code and by federal

13 https://sfconservancy.org/blog/2016/jul/19/patrick-mchardy-gpl-enforcement/
14 https://opensource.com/law/16/8/gpl-enforcement-action-hellwig-v-vmware
15 https://sourcecode.cio.gov/
16 https://opensource.com/government/16/8/us-government-releases-new-policy-free-code
17 https://www.code.gov/

employees and contractors to upstream projects. Agencies must also ensure that their open source repositories include enough information to enable reuse and participation by third parties, including details on licensing.

5. Moglen steps down as FSF general counsel

The Free Software Foundation announced[18] in October 2016 that Eben Moglen had "stepped down" as general counsel to the FSF. Moglen, who is president of the Software Freedom Law Center and a law professor at Columbia, has been one of the most influential lawyers in free software. His career in free software has been closely associated in the public mind with the FSF, for which he provided pro bono legal representation for 23 years. I expect both Moglen and the FSF to remain as engaged as ever in matters of free software legal policy, but likely with more instances of public disagreement or conflicting opinions.

6. Debian and Ubuntu ship ZFS

In the mid-2000s Sun Microsystems released its ZFS filesystem as part of OpenSolaris, licensed under the weak copyleft CDDL[19]. Efforts to port ZFS to Linux were inhibited for many years by legal concerns, including concerns about license conflicts between GPLv2 and CDDL. In recent years the "ZFS on Linux[20]" project has encouraged Linux distributions to package its ZFS kernel module.

Although packaging of ZFS in Debian was held up for some time by licensing concerns, in 2015 Debian Project Leader Lucas Nussbaum revealed[21] that Debian had received legal advice from the Software Freedom Law Center concerning inclusion of ZFS in Debian, which he said "should unblock the situation … and enable us to ship [ZFS] in Debian soon." In January 2016, Nussbaum's successor, Neil McGovern, said[22] that ZFS would be included in Debian as a DKMS package in source code form only, and would be segregated in the "contrib" archive, which contains packages that are not considered to be official Debian.

Ubuntu had included a source-only DKMS ZFS package for some time before Debian began doing so. In a blog post in February, Canonical's Dustin Kirkland announced[23] that Ubuntu would begin shipping a binary ZFS kernel module. Following a flurry of debate over the GPL/CDDL issue, Kirkland said[24] in another blog post that Canonical had discussed the legal issues with Eben Moglen (president of SFLC) and had concluded that distribution of the binary kernel module would be compliant with both GPLv2 and CDDL. Kirkland stressed that the ZFS module was "self contained" and was not a derivative work of the kernel, and the kernel was not a derivative work of ZFS. Kirkland also argued that "[e]quivalent exceptions have existed for many years, for various other stand-alone, self-contained, non-GPL kernel modules."

Shortly after Kirkland's second blog post, the Software Freedom Conservancy and SFLC, which are

18 https://www.fsf.org/news/fsf-announces-change-in-general-counsel
19 https://opensource.org/licenses/CDDL-1.0
20 http://zfsonlinux.org/
21 https://lists.debian.org/debian-devel-announce/2015/04/msg00006.html
22 http://blog.halon.org.uk/2016/01/on-zfs-in-debian/
23 http://blog.dustinkirkland.com/2016/02/zfs-is-fs-for-containers-in-ubuntu-1604.html
24 http://blog.dustinkirkland.com/2016/02/zfs-licensing-and-linux.html

independent of one another, published conflicting analyses[25] [26] of the legality of Canonical's distribution. They agreed, however, on two basic points: (1) Debian's distribution of a source-only module in contrib was license compliant, and (2) loadable kernel modules generally fall within the scope of the GPL copyleft on the kernel.

Conservancy claimed to be speaking on its own behalf as a Linux kernel copyright assignee as well as on behalf of kernel copyright holders participating in its GPL Compliance Project for Linux Developers[27]. In Conservancy's view, Canonical's distribution of the binary kernel module violates GPLv2 and thus infringes copyright on the kernel. Conservancy believes that derivative works involving GPL license incompatibilities with other free software licenses should be subjected to the same legal analysis as GPL/proprietary combinations.

According to SFLC, Canonical's binary ZFS module must be regarded as licensed under GPLv2, since CDDL allows binaries to be under any license and any other interpretation would assume that Canonical was noncompliant with the GPL. Therefore, distribution of the ZFS binary module itself would not violate GPLv2; however, Canonical's otherwise compliant distribution of corresponding source code for the ZFS kernel module and the Ubuntu kernel would "literally" violate GPLv2, because Canonical would be providing the ZFS filesystem source code under CDDL. There are good reasons for a community of copyright holders of a GPL project not to object to this literal GPLv2 violation, because the conduct falls within the spirit or the "equity" of the license.

In SFLC's view, given the tension between the literal and equitable interpretations of GPLv2, "the consensus of the kernel copyright holders' intention … determines which mode of interpretation is to be employed." Here, there was no conclusive or convincing evidence of what type of interpretation the kernel copyright holders intend. SFLC argued that for as long as the kernel copyright holders choose not to object to Canonical's distribution, it should be assumed that the consensus of the kernel licensors is to support the equitable interpretation. SFLC also pointed out that Canonical's potential liability exposure was negligible.

Neil McGovern discussed his experience of the ZFS topic as Debian Project Leader in a talk[28] at DebConf. Other noteworthy statements on the ZFS issue were made by Richard Stallman[29] and by Linux kernel developer James Bottomley[30]. Little has been said about the issue in recent months.

25 https://sfconservancy.org/blog/2016/feb/25/zfs-and-linux/
26 https://www.softwarefreedom.org/resources/2016/linux-kernel-cddl.html
27 https://sfconservancy.org/linux-compliance/
28 http://caesar.acc.umu.se/pub/debian-meetings/2016/debconf16/A_year_in_the_life_of_a_DPL.webm#t=495
29 https://www.fsf.org/licensing/zfs-and-linux
30 http://blog.hansenpartnership.com/are-gplv2-and-cddl-incompatible/

7. Apache Software Foundation bans JSON license

For some of us involved in open source legal matters, Douglas Crockford's[31] JSON license[32] keeps turning up like a bad penny. The JSON license famously modifies the MIT license by adding a sentence before the warranty disclaimer: "The Software shall be used for Good, not Evil." It is not clear whether Crockford intended the license purely as a joke, or as an oblique political statement, or both. Many who care about having a principled basis for classifying licenses as free, or open source, see the "Good, not Evil" clause as conflicting with basic definitional norms that disallow field of use restrictions and discrimination based on field of endeavour. Some have argued that the clause is not enforceable and thus should not be taken seriously; however, the FSF, which classifies the JSON license as non-free, argues[33] that it cannot be presumed that the restriction is unenforceable. Another objection to the license is that "Good" and "Evil" are undefined and thus the scope of conduct that is allowed and prohibited is highly uncertain.

The reason the JSON license is not a matter of complete obscurity is that Crockford has applied it to software that happens to have been widely adopted, including the tools JSLint[34] and JSMin[35] and the JSON Java[36] library ("JSON-java"). Over the years Crockford has refused many requests from developers to change the license, although he has boasted[37] of having granted special permission to IBM and "its customers, partners, and minions, to use JSLint for evil."

For many years the Apache Software Foundation, known for strict rules on licensing under which, for example, the GPL and LGPL are relegated to a forbidden "Category X[38]," treated JSON-java as though it were in its most favoured "Category A[39]" (which contains noncopyleft licenses, such as the Apache License 2.0 itself). Today several ASF projects have dependencies under the JSON license. In October 2016, in a posting[40] to the ASF's legal-discuss mailing list, Ted Dunning called on the ASF to revisit its decision, noting that the JSON license was "substantially hindering downstream adoption." After some discussion, Jim Jagielski, VP of Legal Affairs for the ASF, declared[41] that "the license is NOT CatA and is NOT approved," placing the JSON license in Category X. Jagielski later clarified[42] that no new use of the JSON license by an ASF project would be allowed, but some projects already using code under the license would have a grace period of several months to transition to a replacement. The issue was covered in a November 2016 LWN.net article[43].

Because so many ASF projects have been widely adopted, the JSON license prohibition seems likely to have a significant community impact in encouraging use of open source alternatives to JSON-licensed software.[44]

31 https://en.wikipedia.org/wiki/Douglas_Crockford
32 http://www.json.org/license.html
33 https://www.gnu.org/licenses/license-list.en.html#JSON
34 https://github.com/douglascrockford/JSLint/blob/master/jslint.js#L15
35 https://github.com/douglascrockford/JSMin/blob/master/jsmin.c#L16
36 https://github.com/stleary/JSON-java/blob/master/LICENSE#L13
37 http://dev.hasenj.org/post/3272592502/ibm-and-its-minions
38 https://www.apache.org/legal/resolved#category-x
39 https://www.apache.org/legal/resolved#category-a
40 https://mail-archives.apache.org/mod_mbox/www-legal-discuss/201610.mbox/%3CCAJwFCa34RKbC35_GSg5NxZrQ1%3Db36-zw13f%3Dmc9ayXinibVBHQ%40mail.gmail.com%3
41 https://mail-archives.apache.org/mod_mbox/www-legal-discuss/201611.mbox/%3CA922A412-2E2E-4BD8-9782-AF0757A8439E%40apache.org%3E
42 https://mail-archives.apache.org/mod_mbox/www-legal-discuss/201611.mbox/%3C0CE2E8C9-D9B7-404D-93EF-A1F8B07189BF@apache.org%3E
43 https://lwn.net/Articles/707510/
44 http://creativecommons.org/licenses/by-sa/4.0/

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