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Approximation and Drm: Can Digital Locks Respect Copyright Exceptions?

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Abstract

Technological Protection Measures (TPMs) are the hard core of Digital Right Management (DRM) systems, which enforce the rights of the copyright owner in the digital environment. Copyright scholars expressed concerns that TPMs do not comply with copyright exceptions and limits (Hugenholtz 2000; Koelman 2000; Dusollier 2003; Westkamp 2004). A few solutions to this problem have been proposed in the field of internet services (Mulligan and Burstein 2002; Erickson 2003; Cohen and Burk 2001; Sobel 2003). However, none of these proposals is tailored to optical disks (CDs and DVDs). Yet, the report 'Digital Broadband Content: Music' of the OECD (2005) states that TPMs implemented on optical disks hinder copyright exceptions more often than those applied to internet services. Moreover, in Europe the Copyright Directive exempts TPMs implemented on internet services from compliance with copyright exceptions. This paper therefore outlines possible ways to implement TPMs on optical disks in Europe, in order to achieve their compliance with a list of fundamental copyright exceptions, as identified by previous research (Favale 2008).

Keywords: Digital Right Management; Digital Copyright; Technological Protection Measures; Optical Disks.

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1 Introduction

Digital Rights Management (DRM) was never completely credible as a weapon against professional digital piracy.[2] Conversely, it effectively assists copyright investors in 'keeping honest people honest';[3] that is, fighting against the occasional infringement mainly performed by copying music and videos for private and non-lucrative purposes.[4] Thanks to DRM, every reproduction of a copyright work, legal or illegal, has to be authorized by the right holder. However, the exclusive rights of the owner are subject to limits. A limited duration, the first sale doctrine, exhaustion, and copyright exceptions are designed to protect the fundamental rights of the public. Part of the copyright literature is concerned that technological protection measures (TPMs), implemented within DRM, do not respect these boundaries.[5]

Entertainment producers make substantial investment in research aiming to obtain TPMs always more specialized and versatile. However, compliance with copyright exceptions does not seem to be within their goals.[6] Yet, flexible devices aiming at consumer acceptance may achieve the indirect effect of benefiting copyright limits.[7] A quick glimpse at the records of the European Patent Office,[8] for example, reveals the existence of flexible[9] but robust[10] technology in this field.

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[2] See generally Peter Biddle and others 'The Darknet and the Future of Content Distribution', [2002] ACM Workshop on Digital Rights Management, 18 November 2002, The Wyndham City Center Washington DC, USA http://crypto.stanford.edu/DRM2002/darknet5.doc accessed 25 March 2011

[3] IT scholars reckon TPMs ineffective against professional infringers. There is no DRM system, however sophisticated, that cannot be worked around if you have the right expertise. See Alex Halderman and Ed Felten 'Lessons from the Sony CD DRM Episode' [2006] Center for Information Technology Policy Department of Computer Science Princeton University, published on line http://itpolicy.princeton.edu/pub/sonydrm-ext.pdf accessed 25 March 2011, 23

[4] Ibid, 3

[5] OECD, Working Party on the Information Economy, 'Digital Broadband Content: Music' [2005] http://www.oecd.org/dataoecd/13/2/34995041.pdf accessed 25 March 2011, 92; see generally Bernt Hugenholtz 'Caching and Copyright: The Right of Temporary Copying', (2000) 22(10) *E.I.P.R.* 482-493; cf also Guido Westkamp 'Transient Copying and Public Communications: The Creeping Evolution of Use and Access Rights In European Copyright Law' (2004) 36(5) *Geo. Wash. Int'l L. Rev* 1057-1108, 1078; Kamiel Koelman 'A Hard Nut to Crack: the Protection of Technological Measures' (2000) 22(6) *E.I.P.R.* 272-288 at 275; and Severine Dusollier 'Tipping the Scale in Favour of the Right Holders: The European Anti-Circumvention Provisions', in E. Becker, W. Buhse, D. Günnewig, N. Rump (eds), *Digital Rights Management. Technological, Economic, Legal and Political Aspects*, (Springer-Verlag, Berlin 2003) pp.462-478 , 477

[6] The phonographic industry uses DRM to "fight digital piracy". See eg the website of the International Federation of the Phonographic Industry at www.ifpi.org accessed 22 February 2010

[7] A recent study from the University of Cambridge reveals that the technology to comply with copyright limits is already available: Patricia Akester 'Technological accommodation of conflicts between freedom of expression and DRM: The first empirical assessment', (2009) Cambridge: CIPIL 5/5/2009 < http://www.law.cam. ac.uk/faculty-resources/download/technological-accommodation-of-conflicts-between-freedom-of-expression-and-drm-the-first-empirical-assessment/6286/pdf> 70

[8] The database is available at http://ww.espacenet.org accessed 25 March 2011

[9] Patent application number WO2005111760: Processing Rights in DRM Systems, pub. date 2005-11-24, adding further restrictions to a DRM protected object by the user, eg for parental control purposes. The restriction can loosen up at the act of distribution according to users' preferences (or 'rights' if the law provides for it), but the beneficiary has to use a smart card to self-authenticate

[10] Patent application number US2004202318: Apparatus for supporting advanced encryption standard encryption and decryption, pub. date 2004-10-14

This article suggests that technological protection measures do not in themselves prevent the public from enjoying its rights. On the contrary, thanks to enhanced functionalities, if correctly fine-tuned, they can produce multiple advantages. They can protect the revenues of rightholders while at the same time efficiently distributing the costs among consumers of copyright works. More specifically, well-directed investment in R&D would produce technological protection measures compliant with permitted uses, without impoverishing rightholders and without beneficiaries of copyright exceptions having to become copyright infringers.

A lot has been said on DRM and internet services. Legal research is focused on finding solutions for the Web, which offers great opportunities but exposes copyright owners to relevant threats.[11] Physical carriers (eg optical disks as CDs and DVDs) conversely are neglected by copyright literature. Also, while IT research on TPMs implemented on CDs and DVDs is slowly progressing,[12] digital locks applied to internet services are much more advanced.

One possible reason is that the exponential growth of internet services may suggest that optical disks are formats bound to disappear.[13] However, there are also evidences in the opposite sense.[14] Consumers seem to like the 'touch and feel' of the optical disk.[15] In fact, their market share is still greater than the market share of online music,[16] despite the constant increase of the latter and the slight decline of the former.

Yet, the report 'Digital Broadband Content: Music' of the OECD (2005)[17] states that TPMs implemented on optical disks hinder copyright exceptions more often than those applied to internet services. Moreover, in Europe the Copyright Directive[18] exempts internet works from compliance with copyright exceptions. Article 4 of the EUCD, which introduces a number of copyright exceptions with which TPMs should comply, states:

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[11] Infra, Section 5

[12] For a complete list of all the technological solutions available for CDs and DVDs, see http://www.cdmediaworld.com/hardware/cdrom/cd_protections.shtml accessed 25 March 2011

[13] See Bill Gates speech at Howard University, on the 15 November 2005, at http://www.microsoft.com/billgates/speeches/2005/10-14Howard.asp accessed 25 March 2011

[14] See David Card (Jupiter Research), 'US Music Forecast 2006/20011, 04-01-2007: 'In 2005, US digital music sales more than doubled, reaching over $770 million. That's still a pretty small market compared with the declining $11.2 billion CD business, but digital music and ring tones are where the growth is', at http://www.jupiterresearch.com/bin/item.pl/research:vision/105/id=98637/ accessed 23 February 2011

[15] See the conclusions of Geoffrey Lee and David R. Low 'Internet Pirates: Generational Attitudes towards Intellectual Property Online' (2004) *ANZMAC Conference Proceedings*, 01 December 2004, Wellington, New Zealand. Their study shows that more than 2/3 of music lovers prefer to own a CD

[16] Bill Gates, for example, declared DRM implemented on online music too cumbersome, and advised consumers to 'buy and rip a CD'. See 'Bill Gates on the Future of DRM', on Telecrunch 14 December 2006, at http://www.techcrunch.com/2006/12/14/bill-gates-on-the-future-of-drm/ accessed 5 January 2011

[17] OECD 2005 (n 5) 92

[18] Council Directive 2001/29/EC of 22 May 2001 on the harmonisation of certain aspects of copyright and related rights in the information society *Official Journal* L 167, 22/06/2001 P. 0010 – 0019

> The provisions of the first and second subparagraphs [the exceptions for TPMs] shall not apply to works or other subject-matter made available to the public on agreed contractual terms in such a way that members of the public may access them from a place and at a time individually chosen by them. [19]

Internet works are normally accessed on-demand and are subjected to contractual terms binding for the user. However, the degree of agreement of the user to these contractual terms is debated. Standard adhesive contracts are not negotiated at arm's length, and the legal competence of the private user is normally not comparable with the knowledge of the rightholder. It is not clear therefore whether and to what extent these 'End User Licence Agreements' (the contracts) comply with copyright exceptions or whether they constitute a legitimate waiver of these exceptions. This complex issue deserve to be discussed by future research. For the purpose of this paper we only take notice of this exclusion. The focus of the present work is in fact on DRM implemented on optical disks, which are bound, by current copyright law, to respect copyright exceptions

The legal jurisdiction under scrutiny is the European Union. One fundamental requirement for compliant DRM is to have a defined set of users' rights or allowances. This is instrumental to develop a computer-readable language that implements copyright exceptions on TPMs. The most recent EU Copyright Directive (EC/29/2001), has in fact introduced an exhaustive list of copyright exceptions, which can be a useful starting point for clearly defined usage rules. Obviously, the solution suggested by this article is more difficult -but not impossible- to apply to jurisdictions like the US, which implements a flexible concept as fair use to delimit users' allowances.

2 Legal Framework: the EU Copyright Directive

The EU Copyright Directive of 2001 aims at harmonizing copyright protection among EU Member States, in order to benefit the Internal Market by allowing an easier circulation of copyright works.[20] It defines the principal exclusive rights of copyright holders (the Reproduction Right,[21] the Right to Communication to the public,[22] and the Distribution Right[23]) and sets an exhaustive list of exceptions to these rights for the benefit of users of copyright works.[24] Twenty of these twenty-one exceptions can be optionally implemented by Member States.

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[19] Council Directive 2001/29/EC, Article 4, fourth paragraph
[20] Council Directive 2001/29/EC, Recital 1
[21] Council Directive 2001/29/EC, Article 2
[22] Council Directive 2001/29/EC, Article 3
[23] Council Directive 2001/29/EC, Article 4
[24] Council Directive 2001/29/EC, Article 5

Part of the harmonization strategy also involves a strong protection of technological protection measures, which are the instruments to enforce copyright in the digital environment.[25] This part of the Copyright Directive implements the World Copyright Treaty of 1996,[26] which states (Article 11):

Contracting Parties shall provide adequate legal protection and effective legal remedies against the circumvention of effective technological measures that are used by authors in connection with the exercise of their rights [. . .]

The need for protection of TPMs, given that copyright infringement is easier in the digital environment, has been the object of rising demands from the copyright industry, which claims they are indispensable for economic efficiency. Enforcing copyright in the digital environment without TPMs requires unbearable transaction costs, for the difficulty to identify and pursue every infringer. This problem is eased by the implementation of self-enforcing measures.[27]

To the protection of TPMs, however, the Copyright Directive introduces seven copyright exceptions (Article 6.4), selected from the abovementioned list of twenty-one (Article 5), that rightholders have to respect when they design TPMs. To be more exact, according to the wording of the directive, rightholders have to take 'voluntary measures' to implement these exceptions. If they fail to do so within a reasonable amount of time, Member States have to take 'appropriate measures'.[28]

More details on these 'appropriate measures' are provided by Recital 51 of the directive, which states:

1. In the absence of such voluntary measures or agreements within a reasonable period of time, Member States should take appropriate measures to ensure that rightholders provide beneficiaries of such exceptions or limitations with appropriate means of benefiting from them, by modifying an implemented technological measure or by other means [. . .]

This recital suggests that Member States could enforce legislation providing for a 'modification' of existing technological protection measures, which could involve specific requirements in the design of technical locks,

[25] Council Directive 2001/29/EC, Recital 47

[26] WIPO Copyright Treaty, adopted in Geneva on December 20, 1996, *Official* Journal L 089, 11/04/2000 P. 0008 – 0014

[27] However, the costs of implementing DRM are apparently a barrier to the entry of small businesses in the market. See Paul Petrick, 'Why DRM Should be Cause for Concern: an Economic and Legal Analysis of the Effect of Digital Technology on the Music Industry', The Berkman Center for Internet and Society, Research publication n. 2004-09 (November 2004), at http://cyber.law.harvard.edu/home/uploads/408/DRMPetrick.pdf, accessed 5 February 2011, 14 and 28

[28] Further clarification on both 'appropriate measures' and 'voluntary measures' is provided by Recital 51 of the EUCD. On 'voluntary measures' it states: 'Member States should promote voluntary measures taken by rightholders, including the conclusion and implementation of agreements between rightholders and other parties concerned, to accommodate achieving the objectives of certain exceptions or limitations provided for in national law in accordance with this Directive'. Council Directive 2001/29/EC, Recital 51, third paragraph

allowing users to benefit from copyright exceptions. In practice, though, no provisions of the kind have been implemented by Member States, despite the absence of 'voluntary agreements'.

Both lists of exceptions (respectively for the exclusive rights and for TPMs), however, have been heavily criticised by copyright commentators.[29] Essentially, they reproach to the list provided by Article 5 of the EUCD that it cannot possibly be exhaustive, and that by being basically entirely optional it does not achieve the goal of harmonization claimed by the directive. On the list of article 6.4, moreover, they maintain that there is no justification for the selection of these specific exceptions from the previous list. They are not based, for example, on fundamental freedoms. On the contrary, some exceptions based on fundamental freedoms - like the one for criticism and reviews, based on freedom of expression- are neglected. Therefore, the reason why these specific exceptions have to be compulsorily implemented by Member States is unclear.[30]

The discussion above suggests that one list of compulsory copyright exceptions, for both the exclusive rights of the owner and TPMs (which are a mere tool to enforce them) would be a welcome improvement of the current Copyright Directive. A clear list of fundamental exceptions, moreover, would make easier, from a technical point of view, the implementation in Europe of TPMs that comply with these copyright exceptions.

In previous research[31] we attempt to suggest a method to outline this list of fundamental exceptions. A comparative study on the copyright legislation of the EU27 Member States identified a number of exceptions that

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[29] Thomas Heide, 'The Approach to Innovation Under the Proposed Copyright Directive: Time for Mandatory Exceptions', (2000) 3 *I.P.Q.* 215-23, 223; Michael Hart 'The Proposed Directive For Copyright in the Information Society: Nice Rights, Shame About the Exceptions', (1998) 20(5) *E.I.P.R.* 169-171, at 171, commenting on the proposed Directive; the CPB Netherlands Bureau for Economic Policy Analysis, 'Copyright protection: not more but different', Centraal Planbureau, on line at http://www.cpb.nl/eng/ accessed 22 February 2010, Section 4.4; Lucie Guibault, 'The Nature and Scope of Limitations and Exceptions to Copyright and Neighbouring Rights with regard to General Interest Missions for the Transmission of Knowledge: Prospects for their Adaptation to the Digital Environment', (2003) *E-Copyright Bulletin*, October-December, 39-40; Bernt Hugenholtz, 'Why the Copyright Directive is Unimportant, and Possibly Invalid', (2000) 11 *E.I.P.R.* 501-502, 502; See also generally Bernt Hugenholtz, 'The Future of Copyright Limitations" at *Infoethic 2000*, Third *UNESCO Congress on Ethical, Legal and Societal Challenges of Cyberspace*, Paris, 13-15 November 2000

[30] Lucie Guibault, 'The Nature And Scope Of Limitations and Exceptions to Copyright and Neighbouring Rights with regard to General Interest Missions for the Transmission of Knowledge: Prospects for their Adaptation to the Digital Environment', (2003) *E-Copyright Bulletin*, October-December, 9-10; Severine Dusollier, 'Tipping the Scale in Favour of the Right Holders: The European Anti-Circumvention Provisions', in E. Becker, W. Buhse, D. Günnewig, N. Rump (eds), *Digital Rights Management. Technological, Economic, Legal and Political Aspects*, (Springer-Verlag, Berlin 2003) pp.462-478, 473; see also generally Christian Rutz 'Parody: A Missed Opportunity', 3 *I.P.Q.* 284-315. Moreover, Dusollier indicates in parody a potential backdoor for the much awaited exception for transformative works. See her intervention at the 4 Wizard of OS conference, at www.wizards-of-os.org/ accessed 5 February 2011

[31] The list of fundamental copyright exceptions has been identified by a comparative study of the implementation of the Council Directive 2001/29/EC of 22 May 2001 on the harmonisation of certain aspects of copyright and related rights in the information society (*Official Journal L 167, 22/06/2001 P. 0010 – 0019)* in the EU27 member states. Marcella Favale, 'Fine-Tuning European Copyright Law to Strike A Balance Between the Rights of Owners and Users', (2008) 33(5) *European Law Review* (2008) 687-708, 708

have been implemented from the Copyright Directive by most Member States, seemingly based on national and international constitutional values. We suggest this could be a valuable input to draft a list of fundamental exceptions with which both the exclusive rights and DRM should comply.

This article proposes, as an illustrative example, a DRM system that complies with these exceptions, which are: personal copy; reproduction by libraries (and similar institutions); teaching; research; disability; news reporting; and quotation..[32]

3 Online and Offline Technology

The main difference between technical locks applied on internet works and those applied on physical disks is that on the latter the usage rules are built-in.[33] A music CD or a video DVD, typically rendered by CD players and DVD players, cannot communicate with its 'originator' (the producer) after their distribution on the market. Therefore, their set of policies (usage rules) cannot be changed by the outcome of further negotiations between owner and user. This means that the quality of beneficiary of a copyright exception cannot be ascertained on a case-by-case basis. Conversely, internet goods offer the possibility to interact with users and therefore they can diversify usage rules among consumers.

In practice, none of currently available CDs or DVDs is manufactured with built-in TPMs aiming to comply with copyright exceptions.[34] Most commonly, these TPMs simply prohibit the reproduction of the work. On internet works, on the contrary, a limited number of copies from the purchased product is allowed. We will see below[35] that this feature could satisfy most fundamental copyright exceptions, if correctly fine-tuned.

Solutions outlined for price differentiation on internet services have the potential to comply with copyright exceptions, because they are able to diversify usage rules for each user. At the moment of the subscription of an internet service, in fact, the user can choose which and how many actions he or she wishes to purchase. The price will be differentiated on the basis of this choice. Conversely, interactive technology on optical disks does not seem to be sufficiently advanced to guarantee the same flexibility. Attempts to implement similar technology on music CDs, for example, raised issues of privacy and computer security.[36]

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[32] Ibid, 703

[33] See generally John S. Erickson 'Fair use, DRM and Trusted Computing', (2003) 46/4 *Communications of the ACM* 34-39

[34] OECD 2005 (n 5) 92

[35] Infra, Section 5

[36] On the Sony BMG case see generally Alexander Halderman and Ed Felten, 'Lessons from the Sony CD DRM Episode', Center for Information Technology Policy Department of Computer Science Princeton University, (2006) at http://itpolicy.princeton.edu/pub/sonydrm-ext.pdf accessed 22 February 2010

4 Solutions for a Compliant DRM

Technology scholars agree that developing an algorithm for a DRM system that meets every copyright exception is almost impossible.[37] Conversion of legal norms in machine-readable instructions can only be done by recurring to approximation. They refer to this as a non-satisfactory solution.[38] However, we argue that this is a better option than having DRMs that ignore copyright exceptions altogether. In fact, legal scholars have already proposed solutions for TPMs compliant with copyright exceptions - mostly applicable to internet services - recurring to some approximation.

Mulligan and Burstein,[39] for example, propose to modify Right Expression Languages syntax (in particular XrML, a type of REL)[40] to express both usage restrictions imposed by the owner and users' entitlements. The REL, in short, should express both the rights of the owners and the rights of the users. On a similar note, John Erickson suggests that the user should be able to request online a specific rule-set to the owner (or, more reliably, to a third-party licensing authority) in order to benefit from copyright exceptions. This solution as well is based on fine-tuning RELs like XrML or XACML. [41]

Julie Cohen and Dan Burk, furthermore, sceptical on the possibility that an exhaustive range of negotiated uses could ensure as much benefit as a flexible legal standard (as the one required by fair use)[42] propose a double tier solution (known as the 'key escrow' solution). First, DRM should be designed in a way to embed automatically all possible instances of fair use.[43] Second, a user dissatisfied with the range of available uses could apply to a central authority to receive a decrypting key. The keys to decrypt the copyright work and to access it under unlimited usage permissions should be deposited with the escrow agent (ideally, the Library of Congress, according to the authors). Failure to do so would prevent rightholders to invoke protection against circumvention.[44]

Another suggestion to implement more flexible DRM is put forward by Lionel Sobel. He proposes Internet Service Providers (ISP) as

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[37] See Ed Felten 'A Sceptical View of DRM and fair use', (2003) 46/4 *Communications of the ACM* , 57

[38] Ibid, 58

[39] Deirdre Mulligan and Aaron Burstein, 'Implementing Copyright Limitations in Right Expression Languages (2002) ACM Workshop on Digital Rights Management, at http://crypto.stanford.edu/DRM2002/mulligan_burstein_acm_drm_2002.doc accessed 5 February 2011

[40] Extended mark-up language (see http://wwwxrml.org). Other examples of REL are XACML (Extensible Access Control Mark-up Language, http://www.xacml.org), ODRL (Open Digital Right Language, >http://www.odrl.net>), and the most recent LanguageScript. See AA.VV. 'LicenseScript: A Logical Language for Digital Rights Management, at http://www.ub.utwente.nl/webdocs/ctit/1/00000122.pdf accessed 5 February 2011

[41] See generally John S. Erickson 'Fair use, DRM and Trusted Computing' (2003) 46/4 *Communications of the ACM* 34-39

[42] Dan Burk and JulieJulie JulieJu KLkkkkkCohen, 'Fair Use Infrastructure for Rights Management Systems', (2001) 15 Harv. J.L. & Tech. 41, 57

[43] Ibid, 65

[44] Ibid, 66

intermediaries between owners and users. According to this proposal, ISPs should become retailers of every digital copyright work available on the Internet.[45] This system would involve the implementation of tracking TPMs (more precisely, watermarking and fingerprinting), which will monitor every download of a copyright work from the internet. The right holder would fix the wholesale price of the product and the ISP would fix the retail price. This DRM system would not allow right owners to control the reproduction or the use of the copyright work; it would only track down each download, for billing purposes. These downloads would be charged to the user together with the internet subscription. Users would be free to copy and distribute the works, but in return the ISP would pay the right holder the wholesale price for every downloaded item.[46] The beneficiaries of the exceptions, therefore, would be free to reproduce totally or partially the work, but they would pay for the original copy. This does not pose a problem, Sobel argues, because also in the physical world teachers are allowed to photocopy the pages of a book, but they cannot steal the book from the shop.[47]

All the above solutions have been subject to criticisms. On the DRM languages extensions, doubts were expressed on the possibility to design exceptions' algorithms flexible enough to let through beneficiaries, but rigid enough to stop infringers.[48] To Burk and Cohen some objected that their second layer of protection (the third-party involvement) would be too costly.[49] Sobel's ISP-retailers plan had to face as well objections of feasibility both for the difficulty to convince all ISPs to cooperate,[50] and because his system is easy to work around. Infringers could easily remove the watermark or encrypt the files to hinder their detection.[51]

However, all the above solutions offer invaluable inputs for fine-tuning DRM on optical disks to comply with a list of fundamental exceptions. John Erickson states that 'policies that are subject to many exemptions or based on conditions that may be indeterminate or external are difficult or impossible to automate with drm'.[52] *A contrario*, it could be argued that

[45] Lionel Sobel 'DRM as an Enabler of Business Models: ISPs as Digital Retailers', (2003) 18 *Berkeley Technology Law Journal* 667, 680-681

[46] Ibid, 683

[47] Ibid, 696

[48] Rachna Dhamija and Fredrik Wallenberg 'A Framework for Evaluating Digital Rights Management Proposals', (2003) at http://www.sims.berkeley.edu/~fredrik/research/papers/EvaluatingDRM.html 25 March 2011, 7

[49] Ibid, 7-8

[50] Paul Ganle, 'Digital Copyright and the New Creative Dynamics', (2004) 12 *Int'l J.L. & Info. Tech.* 282, 322

[51] Rachna Dhamija and Fredrik Wallenberg 'A Framework for Evaluating Digital Rights Management Proposals', in (2003), Proceedings of the First Interntional Mobile Workshop: right Management of Information Products on the Mobile Internet, Helsinki (Finland), at http://www.sims.berkeley.edu/~fredrik/research/papers/EvaluatingDRM.htm accessed 22 February 2010, 8

[52] John Erickson,'Fair use, DRM and Trusted Computing', (2003) 46/4 *Communications of the ACM* 34-39, 36

policies subject to few clear and fundamental exceptions are not impossible to automate with DRM. To this end, the extension of Right Expression Languages can be very useful.[53] Therefore, starting from a closed list of norms, it should be possible to elaborate different usage rule-sets to be assigned to clearly identified beneficiaries of copyright exceptions. This would not involve recurring to a central authority, which, as above observed, poses problems of costs, security, and privacy.[54]

The above suggests that a crucial hurdle is represented by the identification a priori of the beneficiaries of copyright exceptions and of the usage rule-sets corresponding to each of them.[55]

5 Uses to Be Permitted: a Possible Rule-set

The activities that beneficiaries of copyright exceptions should be able to perform, for the purpose of this article, are drawn from a cross-reference between EU copyright law and socio-legal existing research. On the one hand we elsewhere identified a number of fundamental copyright exceptions, which are already accepted and grounded in the constitutional principles of most of the 27 member states of the EU.[56] On the other hand, socio-legal researchers have questioned groups of beneficiaries of some copyright exceptions (which happen to coincide with some of the above-mentioned fundamental copyright exceptions) in order to understand in practice what they would like to do (more precisely, what actions they would like to perform) on digital copyright works.

We have stated in Section 2 that the copyright exceptions we choose to select are: personal copy; reproduction by libraries (and similar institutions); teaching; research; disability; news reporting; and quotation.[57] In this section we try to identify what actions need to be performed by the above beneficiaries of copyright exceptions. A valid inspiration for this approach is provided by the 'Use Cases' method.

The 'Use Cases' method, envisaged by Alistair Cockburn,[58] aims at identifying the requirements of a system on the basis of the goals of the users of this system. The operational mechanisms of the system are not analysed. Only the actions that a user of the system can perform are considered and examined. Born in the field of software engineering, the 'Use Cases' approach is now applied to a number of other systems; not least DRM.

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[53] See also Bill Rosenblatt and Gail Dykstra'Integrating Content Management with Digital Rights Management' (2003) *Giantsteps*, at http://www.xrml.org/reference/CM-DRMwhitepaper.pdf accessed 12 march 2010, 18

[54] Centralized collection of data often leads to problems of data management and security

[55] Evident at this point is the importance of an agreement on a list of fundamental exceptions See above, Section 2

[56] See above, Section 2

[57] Ibid, 703

[58] See generally Alistair Cockburn *Writing Effective Use Cases,* 1st ed. (Addison-Wesley Professional 2000)

A study by Intrallect Inc[59] applies this method to the UK education and research communities. The study examines a broad range of practical situations affecting researchers, teachers, students, and libraries while interacting with DRM. Their purpose is to suggest to the Joint Information Systems Committee (JISC)[60] the best approach and practice to adopt in relation with digital rights management.

The authors of the report state: '[t]he use cases are simply a way of defining what people want to achieve'. Clearly, this method seems particularly fit to understand whether TPMs can accommodate the needs of beneficiaries of copyright exceptions (or, more precisely, their entitlements). The Intrallect research refers specifically to three of the beneficiaries of copyright exceptions: teachers, researchers, and libraries. Moreover, it examines a broad range of platforms and tools. We draw from their study only the material directly instrumental to our research.

Use Case templates, as elaborated by Intrallect, require the identification of seven elements: 1) Authors; 2) Use Case Summary; 3) Primary Actor (and goals) 4) Other Actors (and goals); 5) Stakeholders and Interests; 6) Main Success Scenario; 7) Extensions.[61]

For the purpose of our study we mainly focus on the Primary Actors, which in our case are the beneficiaries of copyright exceptions.[62] As for the Authors, we can generally assume that their goal is to have their work known and appreciated. Other players could be entertainment producers, distributors, and TPMs developers. We can assume that their goal consists of recouping their investments. Our main success scenarios are represented by the possibility for beneficiaries of copyright exceptions to utilize their legal privileges *on digital works*. Alternative success scenarios could involve the possibility to enjoy the work in analogue format, if this is satisfactory from a user perspective. Another alternative success scenario, for example, would require rightholders to provide users with digital works without DRM. Total or partial hindrance caused by TPMs to the ordinary activities of beneficiaries of copyright exceptions would represent an unsuccessful scenario.

First, this section preliminarily identifies which actions each beneficiary of an exception wants to be allowed to perform on an optical disk, within her legal allowances. Second, the actions are further translated in

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[59] Charles Duncan and others, a report by Intrallect.Inc for JISC, 'Digital Rights Management, final report', 22-11-2004 at http://www.intrallect.com/drm-study/DRMFinalReportv2.pdf accessed 25 March 2011

[60] The Joint Information Systems Committee, http://www.jisc.ac.uk/ accessed 5 February 2011

[61] This is an explanation of how the Intrallect method works: 'The methodology is based on identifying the key participants (sometimes called 'actors') and their goals. For each primary actor and goal, one use scenario (or 'use case') is developed in detail and is examined to consider all possible alternatives to that scenario. A set of use cases is complete when use cases have been developed for the goals of all the primary participants. These use cases are described in terms of the user's actions and make no assumptions about underlying technology. The use cases are then used to define the requirements for a system that will support these scenarios'. See the Intrallect report (n 59) 23

[62] Their goals are identified in previous research. See Marcella Favale *Access to Copyright Works: Fine-tuning DRM to Balance the Rights of Owners and User,* Ph.D. Dissertation, (2007) University of Nottingham, Appendix A.

a machine-readable language. To this end, we suggest a tailored right expression language on the basis of existing RELs. Third, these actions have to be implemented by TPMs in order to meet the needs of the beneficiaries of copyright exceptions.

At the end of the analysis we will produce:

- A list of Primary Actors;
- A list of 'Actions' that each actor might be willing to perform;
- A list of machine-readable 'Actions' that have to be embedded in compliant TPMs.

First, the list of Primary Actors is obtained from an illustrative list of fundamental copyright exceptions:[63]

1. General users (personal copying);[64]
2. Libraries (reproduction by libraries);[65]
3. Teachers; (teaching/learning and research);[66]
4. Students; (as above);
5. Researchers; (as above);
6. Disabled people (handicap);[67]
7. Journalists (news reporting);[68]
8. Writers in general (quotation).[69]

Now, we need to identify the Actions that each Primary Actor could be able to perform with the current technology. To this end, we review the lists of Actions compiled by previous literature.

Bill Rosenblatt, for example, suggested a list of actions that RELs could implement:

- Render (or Usage) rights, eg viewing on a screen and printing;

- Transport (or Transfer) rights, eg downloading a resource onto a PC, copying onto a CD-ROM, scanning or digitising;

- Derivative (or Re-use), eg using excerpts from a work, embedding the content in its entirety in a different content, editing/modifying the material;

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[63] See above, Section 2
[64] Council Directive 2001/29/EC, Art. 5.3 (b)
[65] Ibid (c)
[66] Ibid, 5(3)(a)
[67] Ibid (b)
[68] Ibid (c)
[69] Ibid (d)

- Utility (or Asset Management), eg back-up a file or change of platform for preservation purposes.[70]

Although useful as a starting point, this list is not sufficiently precise and defined to create an efficient machine-readable language. Conversely, an optimal source of Actions is represented by the 'rights data dictionaries' of two diffused right expression languages: ODRL and MPEG-21, proposed by Intrallect.[71] We adapted the list to the above Primary Actors,[72] as follows:

- Display: the act of rendering the asset onto a visual device;[73]

- Print: the act of rendering the asset onto paper or hard copy form;

- Play: the act of rendering the asset into audio/video form;

- Modify/edit: the act of changing parts of the asset creating a new asset;

- Excerpt/extract: the act of extracting (replicating) unchanged parts (or all) of the asset for reuse into another asset;

- Annotate: the act of adding notations/commentaries to the asset creating a new asset;

- Aggregate/embed: the act of using an asset (or parts of it) as part of a composite work or collection;

- Lend: the act of allowing the asset to be made available for temporary use then returned (without exchange of value). During this period, the asset is only available to the lendee. Temporal constraints are required for downstream use;

- Give: the act of allowing the asset to be given away (ownership transfer) in perpetuity without exchange of value;

- Move/transfer: the act of allowing a digital asset to move between data storage devices. Specification of constraints on the data storage devices may be allowed;

- Duplicate/copy: the act of making an exact copy of a digital asset between data storage devices. Specification of constraints on the data storage devices may be allowed;

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[70] This list is drawn by the Intrallect report (n 59) 38. It is quoted from Rosenblatt. Cf Bill Rosenblatt and others, *Digital Rights Management: Business and Technology*, (M&T Books 2002), no pp. referred

[71] Right data dictionaries of ODRL and MPEG-21. See the Intrallect report (n 59) 16-17

[72] Actions referring to computer software were deleted from the list, because out of the scope of the present study. Use Cases related to a commercial use of the work (eg Sell, Loan or Lease) were also excluded, because beneficiaries of copyright exceptions are not entitled to these actions

[73] The explanation of every action is quoted from the Intrallect report (n 59) 16

- Backup: the act of making copies of an asset for the purpose of guarding against the loss of the original due to accident or catastrophic media or equipment failure;

- Save/export: the act of saving a copy (including any changes) of an asset to permanent storage;

The Intrallect report cautions that the list of uses might be insufficient. However, the uses listed above may nevertheless provide the majority of possible Actions allowed by the current technology.

By focussing on e-books, music, films, and multimedia material stored on optical disks, the list can be further simplified. Display and Play can be merged into Access to the copyright work. Give and Lend are not applicable, because they take place through the physical carrier. Aggregate involves a partial or total reproduction of the work, which is subsequently used with other material. Modify/Edit on optical disks is currently not possible. Annotate is a function currently available on e-books, but it does not affect copyright exceptions. Move and Save/Export involve copying the copyright work on another digital carrier (eg hard disk, flash card, USB, portable player, etc) therefore they can be regrouped in a single action (eg Move). Extract refers to partial reproduction, useful for citation or illustration. The Copy action has to be intended as the duplication of the whole content of the disk; whereas other types of reproduction (eg partial, analogue) fall under other Actions (eg Extract, Print).The action of Backup is absorbed by Copy. Finally, Print would refer to reproduction on analogue carriers (eg paper).

All above considered, the resulting actions are:

- Access;

- Copy (duplication of the disk);

- Extract (partial copy);

- Print (analogue copy);

- Move (copy to a different digital carrier)

Below is a synoptic table of Actions that Primary Actors might require to perform, drawn from the case-scenarios of the Intrallect Report.[74] This illustration of beneficiaries' needs and corresponding compliant TPMs would not be possible without some approximation. Ideally, we suggest approximating by consistently applying the same rule. In the example below, we choose to follow the principle outlined by Thomas Hoeren: '*in dubio, pro libertate*'.[75] In essence, whenever a simplification is imposed, it should be in favour of the user.

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[74] See Intrallect report (n 59) Appendix C, 9 at http://www.intrallect.com/drm-study/FinalReportAppendixv2.pdf accessed 25 March 2011

[75] Thomas Hoeren 'Access Right as a Postmodern Symbol of Copyright Deconstruction', *ALAI USA 2001*, New York, 13-17 June, at http://www.alai-usa.org accessed 25 March 2011

Table 1.

Beneficiary	Needs	TPM Actions
Common users	No limits on Access, Copy allowed in limited number on both digital and analogue form (Print). Unlimited Possibility of carrier-shifting	Access, Copy (limited in number), Extract, Print (limited in number), Move
Libraries	No limits on Access, Copy allowed in unlimited number on both digital and analogue form (but monitoring for fair compensation), especially from old to new technology, for conservation purposes.	Access, Copy, Extract, Print (with counter), Move
Teachers	No limits on Access, Copy allowed in unlimited number on both digital and analogue form. Extract unlimited. Unlimited Possibility of carrier-shifting	Access, Copy, Extract, Print, Move
Students	No limits on Access, Copy allowed in limited number on both digital and analogue form. Extract unlimited. Unlimited Possibility of carrier-shifting	Access, Copy, Extract, Print, Move
Researchers	No limits on Access, Copy allowed in limited number on both digital and analogue form. Extract unlimited. Unlimited Possibility of carrier-shifting	Access, Copy, Extract, Print, Move
Disabled people	No limits on Access, Copy allowed in limited number on both digital and analogue form. Unlimited Possibility of carrier-shifting; plus magnifying and readability with devices for blinds.	Access, Copy, Extract, Print, Move
Journalists	No limits on Access, Extract allowed in unlimited number on both digital and analogue form. Unlimited Possibility of carrier-shifting	Access, Extract, Print, Move
Writers	No limits on Access, Extract allowed in unlimited number on both digital and analogue form. Unlimited Possibility of carrier-shifting	Access, Extract, Print, Move

The table above gives some preliminary directions on how to fine-tune TPMs in order to accommodate the needs of the identified beneficiaries of copyright exceptions. First, no access-control device should be implemented on optical disks. Carrier-shifting, as well, should be always possible.[76] In practice, tracking devices as watermarking and fingerprinting, for example, could be used to identify malicious distribution in peer-to-peer networks.[77]

Second, users should be always allowed an unlimited partial reproduction of copyright works. In fact, a limited portion of the copyright work cannot circulate on the market in competition with the original copy. Against malicious 'collages', again, tracking devices could be called into action.

Furthermore, for the purpose of news reporting, quotation, and research, copying part of the work should always be possible; even with limited sampling (eg the 10% of the whole). The number of samplings, however, should be unlimited.

To private users, a limited number of copies from the original disk and unlimited carrier-shifting should be allowed; this will satisfy the private copy exception.[78] For libraries, educational institutions, and similar bodies special editions should be available. Patrons should be allowed to make a limited number of copies from the original (even in a virtual library), without the possibility to make a copy of the copy. Libraries can monitor the number of copies performed by patrons, to calculate the fair compensation due to rightholders. Moreover, libraries, archives, museums, and other digital repositories should be allowed unlimited copying from the copies, in order to preserve our cultural patrimony in digital format.

Finally, teachers would need an unlimited number of reproductions. They could retrieve their special edition through the institutions in which they are employed. Moreover, they could take advantage of the special licences offered to university libraries and educational institutions. The printout of an e-book, or a web page, or a shot of a video should be always

[76] The latter feature, admittedly, creates peculiar difficulties. The music, text, or video file, once 'ripped' from the physical carrier does not maintain the same characteristics; it normally loses altogether usage restrictions. Admittedly, at this point every infringing use is possible. However, in practice most of music CDs' ripping is performed only to change carrier; most commonly to transform the music CD in MP3 or WMA files to be listened to on a portable player. In fact, DRM developers are focussing on copy protection that impede traditional ripping but offers on the same music CD a WMA version of the music track. The solution is developed by Microsoft and Macrovision. The 'portable' files would be subject to the same usage rules of internet downloadable music. Cf Mike Snider, 'Microsoft, Macrovision join to halt CD 'ripping', [2003] *USA TODAY* http://www.usatoday.com/tech/news/techinnovations/2003-04-23-cds_x.htm accessed 31 March 2011

[77] The same solution, involving watermarks and tracking devices to be implemented instead of copy-protection is envisaged by Thierry Maillard and Teddy Furon 'Towards digital rights and exemptions management systems' (2004) 20(4) *Computer Law & Security Report* 281-287

[78] The number of copies could be negotiated between rightholders and users, rather than imposed by rightholders

possible.[79] In this field, visible watermarking can help fighting malicious commercial diffusion.

In essence, all above shows that applying a reasonable amount of approximation can help resolving the conflict between copyright exceptions and DRM. Obviously, the approximation should be inversely proportional to the progress of technology. Therefore, increasingly sophisticated DRM will require less and less approximation, and it will hopefully accommodate an increasing number of copyright exceptions, or instances of fair use. Crucial to this end is the activity of special control authorities that monitor legal and technical progress and issue guidelines to modify DRM in accordance.

6 Conclusion

Achieving a compliant DRM system harmonized at international level seems impossible in the light of the current state of the art.[80] However, perfectible and broadly satisfactory solutions are within our reach. Law is complex, articulated and unstable (subject to interpretations). When instructions are dictated by law, therefore, the gap between human-readable and machine-readable languages enlarges significantly.

Approximation is therefore crucial to 'streamline' legal norms. To this end, the most indisputable copyright exceptions need to be identified, and optical disks have to embed fixed usage rules that allow copyright permitted uses. This paper suggests that achieving interoperability among carriers and fine-tuning copy-controlling TPMs would already get us very far down this road.

In previous research we suggested a method to identify the most indisputable copyright exceptions at European level. In this paper we proposed a model implementing TPMs that comply with a defined list of copyright exceptions, like those identified in this previous research. However, this solution is not limited to the EU jurisdiction. Other legal systems like the American, for example, could also develop similar models. To this end, they preliminarily need to identify a number of instances of fair use, possibly with the help of a third party (for example the Library of Congress) as it has been already suggested.[81]

[79] Surprisingly, on e-books the option 'print' is often disabled

[80] In this sense we agree with Professor Felten. Ed Felten, 'A Sceptical View of DRM and Fair Use', (2003) 46/4 *Communications of the ACM* , 57. Also Peter Yu argues that a digital copyright system without leeks is impossible (but this is not necessarily a problem). Peter K. Yu, 'Anticircumvention and Anti-Anticircumvention', (2006) 84 *Denv. U. L. Rev.* 13, 72

[81] This solution has been suggested by Cohen and Burk (n 42) 57.

In short, different methods can be elaborated by further research, adapted to each specific jurisdiction, in order to get to results similar to those outlined by the present article. They all would have in common an approach that recurs to approximation.

A decade is elapsed in Europe from the first copyright directive addressing copyright infringement in the digital environment and consequent protection of TPMs. The first similar piece of legislation in the US is even older.[82] Since then, many commentators put forward more or less creative solutions for TPMs complying with copyright exceptions.

However, to date no technical locks on optical disks (or on digital products on different carriers) have been implemented with the declared intent to comply with copyright exceptions. Economic, political and technical factors are obviously behind this issue. We only examined the problem from a legal and technological point of view; and we found that a small amount of approximation could take us very close to a solution satisfactory for both owners and users of copyright works.

To those concerned that such proposal would not meet all copyright limits and all demands of beneficiaries of copyright exceptions, we replied in two ways: First, approximation should consistently follow a rule in favour of the user. This seems more coherent with the ultimate goal of copyright protection: the circulation of culture and knowledge. Second, approximation should be inversely proportional to the technological state of the art: more sophisticated DRM system would require less and less approximation.

In conclusion, we can spend also the next decade looking for perfect TPMs, providing for the optimal amount of reward to owners and the optimal amount of protection to users of copyright works, or we can change our approach. The present article is based on current legislation and on currently available technology. This suggests that with little modification, legal and technological instruments are already available to develop TPMs complying with copyright exceptions.

[82] The Digital Millennium Copyright Act 1998.