

Introduction

Software development over the last decades represents a pace of change not seen since the Industrial Revolution. Software is pervasive, affecting virtually every aspect of human life in all parts of the world. From the perspective of intellectual property rights (IPRs), discourse and debate focuses not only on how software should be protected, but also on a myriad of issues reflecting the many roles that software plays in digital distribution of creative content. This paper summarizes some of those issues, and provides information on current activities of WIPO that address them.

1. Brief History of Copyright Protection of Computer Software

WIPO started to consider the question of the legal protection of computer programs in the 1970s, and, first, the idea of working out a *sui generis* system emerged. The *sui generis* protection covered all three elements of computer programs: object code, source code and documentation. “Source code” is the original code of the computer program written in program languages which can be read and understood by human beings, particularly those who are specialized in this field; “object code” is a version of the program that is directly usable by a computer, in binary form – a series of “zeros” and “ones” – that computer processors may understand, but human beings cannot unless it is “decompiled”, that is transformed into source code. However, the WIPO Model Provisions on the Protection of Computer Programs which provided for a *sui generis* system were not followed by national legislators, and the idea began to prevail that copyright should be applied for the protection of computer programs. In February 1985, WIPO and UNESCO convened in Geneva a joint Group of Experts on the Copyright Aspects of the Protection of Computer Programs. At this meeting, on the basis of a thorough study¹ and an animated debate, a breakthrough took place towards the recognition of computer programs.²

¹ “Legal Protection for Computer Programs: a Survey and Analysis of National legislation and Case Law” by Michael S. Keplinger (document UNESCO/WIPO/GE/CCS/2).

² As the study presented it, at that time, there were still only five countries – in chronological order: the Philippines, the United States of America, Hungary, Australia and India – which had provided in their statutory law on copyright protection of computer programs. After the February 1985 meeting, in May, June and July, within less than two months, for example, the following four countries recognized, in their statutory law, such protection (in chronological order): Germany, May 23; Japan, June 14; France, July 3; and United Kingdom, July 16. (This is also a good example of how the “guided development” period contributed to the harmonization of copyright laws).

National laws which already contained provisions on the copyright protection of computer programs, in general, granted the same kind of protection as for other categories of works. It is another matter that they also included certain “genre-specific” provisions, such as special exceptions for the making of back-up copies or for “decompilation” of programs in order to create other, interoperable programs. There were, however, still some countries which, although they were ready to keep computer programs within the general copyright paradigm, wanted to apply a regime which were similar to the protection of the borderline category of works of applied arts/industrial designs (with shorter term of protection and with the possibility of applying material reciprocity). There were then two developments which completed, at the level of binding regional and international norms, what had been worked out at the WIPO forums in the form of a “soft law” model: first, the publication, in July 1991, of the Computer Programs Directive of the European Community and the adoption, in April 1994, of the TRIPS Agreement, both of which clarified that computer programs should be protected as literary works under of the Berne Convention.

Article 10 of The TRIPS Agreement contains an interpretive provision stating that computer programs, whether in source or object code, shall be protected by the Berne Convention. Article 4 of the 1996 WIPO Copyright Treaty (WCT) includes the same clarification in very similar terms.

There are very few voices today that argue against copyright protection of computer programs. Computer programs are not “merely” technical solutions, even if software developers are sometimes considered as “outsiders” by other, more traditional creators in the musical or literary fields. Indeed software itself is not just a technical result, but an author’s creation which has a technical character. The only difference is the “active” nature of the computer program, meaning that it has technical (physical) effects in computer hardware during its operation. But this is not a reason for the exclusion of software – as a creative, original expression – from copyright protection.

2. Protection of Software under the WIPO Copyright Treaty

Article 4 of the WCT states that computer programs are protected as literary works within the meaning of Article 2 of the Berne Convention. Such protection applies to computer programs, whatever may be the mode or form of their expression. In an agreed statement it also clarifies that the scope of protection for computer programs under Article 4 of this Treaty is consistent with the Berne Convention and on par with the relevant provisions of the TRIPS Agreement.

The WCT does not contain any definition of “computer program”. In the course of the preparatory work of the Treaty, it was agreed upon that the definition of “computer program” adopted as part of the WIPO Model Provisions on the Protection of Computer Programs was still valid. This definition reads as follows: “‘computer program’ means a set of instructions capable, when incorporated in a machine-readable medium, of causing a machine having information-processing capabilities to indicate, perform or achieve a particular function, task or result”. Definitions of “computer programs” included in national laws, are, in general, in harmony with the basic substantive elements of the above-quoted definition in the Model Provisions.³

However, sometimes a broader definition of “computer program” is used which also includes the preliminary material for the creation of a program. For example, Article 1.1 of the Computer Programs Directive of the European Community⁴ provides that “for the purpose of this Directive, the term ‘computer programs’ shall include their preparatory design material”. One of the recitals of the Directive indicates what is meant by the notion of preparatory material; it reads as follows: “Whereas, for the purpose of this Directive, the term ‘computer program’ shall include programs in any form, including those which are incorporated into hardware; whereas this term also includes preparatory design work leading to the development of a computer program

³ For example, Section 101 of the U.S. Copyright Act defines “computer program” as “a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result”. Article 2(xbis) of the Japanese Copyright Law contains a similar, simple and general definition, according to which a “[computer] program” means an expression of combined instructions given to a computer so as to make it function and obtain a certain result.”

⁴ Council Directive of 14 May 1991 on the legal protection of computer programs.

provided that the nature of the preparatory work is such that a computer program can result from it at a later stage.” It should be emphasised that the preparatory material the way it is understood, for example, in the Computer Programs Directive is not covered by the concept of “computer program” proper. This is so since such preparatory material cannot be regarded yet as a set of instructions the purpose of which is to cause a computer to execute a particular task or function; it is only a basis for the creation of such set of instructions in a later stage. This means that, although national laws may extend the definition of “computer program” to such preparatory material, under Article 4 of the WCT (as well as under Article 10.1 of the TRIPS Agreement which also only speaks about computer programs) this is not an obligation. It is another matter that such preparatory material also may, and in general do, deserve copyright protection, as such, in accordance with the general provisions on literary and artistic works.

A further issue concerning the concept of “computer program” is whether the images generated on screens as a result of the operation of a program (for example, in the case of video games) may or should be regarded as parts of a “computer program”. It is possible to find certain views according to which an affirmative answer should be given to this question, and such views have been accepted exceptionally even at the level of national legislation, but the dominant opinion, as well as the dominant position under national laws, is that the images generated by a computer program in the form of screen display go beyond the concept of computer programs proper.⁵ The concept of “computer program” under Article 4 of the WCT also does not extend to the images generated by computer programs on screens.

Screen displays containing moving images may, and, if they correspond to the requirement of originality, they do, enjoy copyright protection as audiovisual works (and fixed images also may and frequently are protected as graphic or photographic works). It is also important to note that the copyright status of the different categories of works are

⁵ For example, the concept of “computer programs” under the Computer Programs Directive of the European Community does not extend to the results of the operation of the computer programs. The same may be said about the U.S. law as reflected in several court decisions. Paul Goldstein sums up the U.S. legal situation in the following way: “Video games typically consist of two separable elements, each independently copyrightable: a computer program, characteristically embodied in a semiconductor chip located in the game console, and the animated audiovisual display that the computer program projects onto a video screen when activated by the player. Rights in the computer program can be infringed without infringing rights in the audiovisual display, and rights in the audiovisual display can be infringed without infringing rights in the computer program. Although the images in video game displays may appear in no fixed sequence, courts have generally held that they meet section 101’s

not necessarily the same (see the special provisions on cinematographic works in Articles 14 and 14*bis* of the Berne Convention and the specific provisions concerning computer programs mentioned below). Therefore, the differentiation between the copyright status of computer programs and that of screen images generated by them seems particularly justified.

Article 4 of the WCT can be understood as an adapted version of the clarification included in the TRIPS Agreement regarding computer programs. Article 10.1 of the TRIPS Agreement provides as follows: “Computer programs, whether in source or object code, shall be protected as literary works under the Berne Convention (1971)”. The question may emerge: why this provision speaks about the forms of computer programs - - source code and object code -- when, under Article 2(1) of the Berne Convention, a literary or artistic work is protected “whatever may be the form or mode of its expression”. The reason seems to be that this was necessary in order to reject certain unfounded views that computer programs may only be protected by copyright as literary works as long as they are in source code, and that programs in object code, due to the utilitarian purpose of programs in such code, are not protected (this position was wrong, not only because the Berne Convention, in general, does not allow exclusion of works from copyright protection just because they serve utilitarian purposes, but also because it had neglected that programs may be decompiled from object code into source code).

The agreed statement concerning Article 4 WCT was adopted at the request of some delegations, mainly from developing countries, which wanted to make sure that the scope of application of the protection of computer programs under Article 4 does not change – and, in particular, that it is not extended – in comparison with what is provided in Article 10.1 of the TRIPS Agreement. This has been found necessary due to the fact that the text of Article 10.1 of the TRIPS Agreement and that of Article 4 of the WCT are not identical. The former speaks about “computer programs, whether in source code or object code”, while the latter about “computer programs, whatever may be the mode or form of their expression”. The latter text seems more appropriate since it is the one which corresponds to the provisions of Article 2(1) of the Berne Convention (from where

the expression “whatever may be the mode or form of their expression” has been taken word by word). It seems also more appropriate considering the possibility that, in the future, the source code/object code categorization might become obsolete.

3. Patent Protection of Computer Software

Many in the legal community took the view that software would never qualify for patent protection in addition to copyright, because a computer program was too similar to a mathematical algorithm.⁶ But key court decisions and other developments in the period from 1980 to 2000 changed this perception and as a result software is now patentable subject matter in a number of different jurisdictions.⁷ The debate is not over, however, as evidenced by the EU Parliament's rejection, on July 6, 2005, of a proposed Directive on computer-implemented inventions. The proposed Directive aimed to harmonize the way that national patent laws deal with computer-implemented inventions, and to ensure that those who invest in developing new products dependent on computer implemented technology could obtain patent protection. To some extent such inventions can already be patented by applying to either the European Patent Office (EPO) or the national patent offices of the Member States. However enforcement of patents is dealt with by national courts and, as the law may differ between Member States, the level of protection may, in practice, also vary.

The debate on intellectual property protection of computer software continues at the national and international levels. The controversy is linked to the unique nature of computer software that performs technical functions through creative expression. Although copyright protects "literal expressions" of computer programs, it does not protect "ideas" behind the computer programs, which often are a core part of their commercial value. For example, two programs with different text (that is, different "expressions") can carry out a substantially identical function. Under copyright, the

⁶ Mathematical algorithms constitute just one of many judicially created exceptions to the statutory subject matter of patent law. Some others include laws of nature, abstract ideas, and business methods. The latter, business methods, was eventually struck down in *State Street Bank & Trust, Co. v. Signature Financial Group, Inc.*, 149 F.3d 1368 (Fed. Cir. 1998). In addition, patents must meet the requirements of non-obviousness, novelty, and usefulness.

⁷ In the US these cases were: *Diamond v. Diehr*, 450 US 175 (1981) (holding that application of a mathematical formula embodied in a software program that performed a useful process qualified for patent protection); *In re Alappat*, 33 F.3d 1526 (Fed. Cir. 1994) (en banc) (holding that Diehr's "useful function" requirement could be satisfied if the software ran on a general purpose computer); *In re Beauregard*, 53 F.3d 1583 (Fed. Cir. 1995) (the PTO announced it would accept patent claims for software-based inventions even if not implemented in hardware, for example if it was embodied in a floppy disk); *State Street*, supra n.3 (striking down the long-standing "business method" exception and cementing recent precedent protecting software patents).

second comer can develop a program having an identical function, but which expresses a completely different text. Since, in fact, ideas behind programs often provide technical functions such as controlling machinery or regulating room temperature, program developers started to seek protection of computer software through the patent system. In other words, copyright law merely protects the specific expression of code in a program. Patent law, on the other hand, protects the underlying functionality of the program; it protects what the code does, not just how it is written. Therefore, in general terms it has been said that copyright protects against piracy, while patents protect against copying by competitors.⁸

4. Open-source software and new business models

Commercial software developers use licensing schemes that limit the scope of use and transferability of their products and prevent – except in cases permitted by law – access to source code. Open source software (OSS) is software for which the underlying programming code is available to users and permits them to read it, make changes to it, and build and distribute new versions incorporating their changes. Some aspects of OSS software require further clarification:

- OSS is “free”, in the sense of the freedoms granted to the user, not because it is distributed free of charge, as OSS can be distributed for a fee.

- OSS represents a particular way of exercising rights under copyright, and the open source development model is a form of distribution that relies upon the copyright owner’s exclusive distribution rights. Under the OSS model, the rights to copy, modify and redistribute are granted to the user subject to license conditions in the applicable open source license. OSS licenses are copyright licenses, and preserve the copyright in the software: OSS is not in the public domain.

⁸ See David S. Evans & Anne Layne-Farrar, SOFTWARE PATENTS AND OPEN SOURCE: THE BATTLE OVER INTELLECTUAL PROPERTY RIGHTS, 9 VA. J.L. & TECH. 10, § B(1)(a) (2004) (as explained by an interviewed subject, “Patents are inter-industry mechanisms for creating value. Copyright is creating protection between the industry and the channel or end customers.”). Also, the penalties for patent infringement are generally much harsher than for copyright infringement, and apply even if one is not aware of the patent’s existence.

- There are many types of open source software, mainly differing in the licensing terms under which (altered) copies of the source code may (or must) be redistributed. There are currently more than 50 different OSS licenses⁹. One popular model, the BSD (an acronym for “Berkeley Software Distribution”), is highly permissive and allows taking the software and doing whatever one wishes with it, including modification and distribution of free or proprietary derivatives, provided that each copy contains a specified form of license that includes a copyright notice and a disclaimer of warranties and liability. Another widely known model permits free use, modification and redistribution of the software, but is more restrictive than the BSD and other OSS licensing models. Examples of this approach include the Free Software Foundation’s General Public License (“GPL”) and Lesser General Public License (“LGPL”), which permit modification and distribution of free derivatives, but preclude creation of proprietary derivatives.

The benefits that open source software may offer include access to source code, community-based development, local skills and capacity building, freedom from vendor lock-in, reduced costs, broad rights, and the ability to customize to local conditions. However, while open source software licensing is increasingly well

⁹ For a summary of OSS licenses, see Arnoud Engelfriet, “The best of both worlds” Intellectual Asset Management August/September 2006, at p.37.

accepted, not all these licenses have yet been fully tested in the courts of various legal jurisdictions¹⁰.

There are a number of business models based on OSS, including under the restrictive GPL model. In some cases, proprietary distribution of a program is followed by an open source, free distribution when a new version of the product is made available (under a proprietary model). This allows revenue to be obtained from clients interested in using the new version without delay while limiting competitors' access to the free versions. Under other schemes software is made available under an OSS model from the beginning but only, and against payment, to a restricted number of clients. After a period of time the software is made available to all, for example, via an open website. Simultaneous, parallel distribution under GPL and proprietary models appears as another business modality. Under this approach, GPL distribution is coupled with the offer of maintenance and other services.

While there are differences of approach in the development of proprietary and open source software, both forms are growing in market presence. Increasingly, software products combine both proprietary and open source code. The use of OSS in mixed platforms can offer important benefits in product development, including high quality solutions, reduced costs and shortened development periods. But this mixed approach also raises some technical or licensing implications that require consideration. For example, if any OSS is included in a software product, the OSS license may require that the entire product be published as OSS (e.g., the GPL's "viral effect"). Moreover some tension is evident in ongoing discussions over the emerging GPLv3: for example, software developers involved in maintaining the "kernel" to the Linux operating system have expressed frustration regarding three key aspects of the draft license – provisions that preclude use of DRM technologies in relation to open-source code covered by the license; clauses permitting numerous variants of the GPL to emerge; and hostility towards software patents, i.e., attempts to limit the ability of contributors to sue downstream users of their technology for patent infringement.¹¹

¹⁰ For information on the legality of the General Public License (GPL), see <http://www.newtechusa.com/Viewpoints/GPLLegalityLinks.asp>.

5. Digital Distribution of Content. Internet Intermediaries, P2P file-sharing.

Software plays a key role in structuring the ways that creative content is distributed, whether in the form of centralized downloading or streaming systems, or through P2P file-sharing. Moreover digital rights management (DRM) software enables the use and management of content in conformance with the rights of creators and the legal interests of beneficiaries of limitations and exceptions to rights.

Increasingly, interest and concern is focusing on copyright issues relating to “Internet intermediaries” – a category of actors in the information society that is widening as technologies develop, and may now include Internet service providers (ISPs), search engines, online auction sites and portals, and distributors of file-sharing software for peer-to-peer (P2P) networks. The rapid rise and popularity of P2P networks present copyright owners and the copyright-based industries (such as music, film and software) with both potentially lucrative new business models and the threat of rampant infringement of their intellectual property rights. What responsibility should the providers of, for example, P2P services and search engines bear for the actions of users who illegally trade music, films and software? Internet intermediaries, as providers of services that enable these transactions to occur, are at the center of global debate involving complex policy, legal and business issues. The international response has varied between cooperation and litigation. In the EU the “European Charter for the Development and the Take-Up of Film Online”, launched at the 2006 Cannes Film Festival by DG Information Society Commissioner Vivian Reding, is a self-regulatory approach to promoting legal distribution of audiovisual content and respect for intellectual property.¹² On the litigation side, the Recording Industry Association of America has instituted several thousand legal actions against individual file sharers, fuelling a public debate over issues of free speech and privacy. Court cases on these issues have taken place or are currently before the courts in a number of countries

¹¹ See, for example, Kernel developers’ position on GPLv3”, September 15, 2006, at <http://lwn.net/Articles/200422>.

¹² See http://ec.europa.eu/avpolicy/docs/other_actions/film_online_en.pdf

including Australia, Belgium, China, Chinese Taiwan, Germany, Japan, the Netherlands, the Republic of Korea and the United States, involving high stakes and millions of users.

In April 2005 WIPO organized a seminar on “Copyright and Internet Intermediaries”, which included wide-ranging discussion on regulatory perspectives on intermediary liability, notice-and-takedown procedures, peer-to-peer (P2P) services (the case of online music), and possible future policy directions. Speakers included representatives of the US Copyright Office and the European Commission, eBay and Verizon Communications and the UK Publishers Association. While there was no consensus that action is needed at international level, there was general dissatisfaction with the current piecemeal approaches that provide different rules of the game in different countries and regions of the world.¹³

5. Fighting Software Piracy in a Global Environment

Thirty five percent of the software installed on personal computers worldwide was pirated in 2005, the same level as in 2004. Yet, losses due to piracy increased from \$33 billion to \$34 billion¹⁴. The growing problem of online piracy poses a significant challenge to the long-term viability of global digital commerce. Piracy is sometimes fed by a vision of the Internet that says it is acceptable to appropriate the creative works of others in order to disseminate them to the world free of charge. This vision will inevitably lead to a global reduction in creative output. Moreover, any vision of the Internet that would permit piracy victimizes local culture as well as the economies of developing countries. The victims of piracy include artists whose creativity goes unrewarded, governments who lose hundreds of millions in tax revenues, national economies that are deprived of new investments, consumers whose product choices are fewer and less diverse, and the producers of creative works who, due to rampant theft, have fewer resources to invest in the development of new digital products and services.

¹³ The papers presented at the Seminar can be found at http://www.wipo.int/meetings/2005/wipo_iis/en/.

¹⁴ Third Annual BSA and IDC Global Software Piracy Study, May 2006, <http://www.bsa.org/globalstudy>
The Study estimates that the rate of software piracy in the Asia-Pacific region was 54 percent during 2005.

Until fairly recently, unauthorized copying of software required physical exchange of floppy disks, CDs or other hard media. But software piracy has become much easier as Internet use spreads (an estimated one billion people around the globe will have Internet access by the end of this year), gets faster and ever less expensive. The Internet allows products to move from computer to computer, with no hard media transaction and little risk of detection. Some piracy schemes may even involve computers without the owner's knowledge. Piracy that once required an understanding of complex computer codes can now take place with the click of a mouse over peer-to-peer networks, through mail order and auction sites, over news groups or even as simple email attachments.

Strong measures are needed at local, national and international level to counter these dangerous trends. For instance, the Computer Program Deliberation and Mediation Committee of Korea has embarked upon the creation of a "fair-use environment" for software through a number of anti-piracy measures, including consultation on legitimate software management, free software to detect illegal copies, monitoring of suspicious websites, and an awareness campaign to change public attitudes toward legitimate software in Korea.¹⁵

The Business Software Alliance, which represents the software industry, has recommended several concrete steps for Governments to take in reducing software piracy, including implementation of the WCT, creation of strong enforcement mechanisms and resources dedicated to applying them, and increased public education and awareness.¹⁶

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¹⁵ See <http://www.pdmc.or.kr/>.

¹⁶ A detailed list of steps can be found at Third Annual BSA and IDC Global Software Piracy Study, May 2006, <http://www.bsa.org/globalstudy>, page 10-11.