8: Computer Programs

> Article 10.1 Computer Programs and Compilations of Data
>
> Computer programs, whether in source or object code, shall be protected as literary works under the Berne Convention (1971).

1. Introduction: terminology, definition and scope

Article 10.1 requires Member States to recognize computer programs as literary works under the Berne Convention. The Berne Convention itself does not explicitly provide that computer programs constitute copyrightable subject matter; however, works enumerated in Article 2 of the Berne Convention are mere illustrations of the kinds of works to which copyright might extend. Further, these illustrations are not exhaustive. Consequently works such as computer programs that exhibit utilitarian characteristics but also contain expressive elements are legitimate candidates for copyright protection.[61]

Since TRIPS does not provide any definition of the term "computer program", Members may keep the definitions they adopted under their domestic laws prior to the entry into force of TRIPS.[62] For example, under the 1976 U.S. Copyright Act, a computer program is defined as "a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result."[63] The Japanese Copyright Law states that a computer program is "an expression of combined instructions given to a computer so as to make it function and obtain a certain result."[64] While the U.K. law does not provide a definition of computer programs, it extends copyright protection both to the program as well as drawings, stories and other traditional works that are generated by the program.[65]

Article 10.1 requires copyright protection for computer programs whether in "source code" or in "object code." Source code is a level of computer language

[61] Note that computer programs must satisfy all the requirements, such as originality, of other copyright works.

[62] See also Section 6.1 of this chapter, below.

[63] 17 U.S.C. §101.

[64] Japan, Copyright Act, Article2(1)(Xbis).

[65] United Kingdom, Copyright, Designs and Patents Act 1988, §178.

consisting of words, symbols and alphanumeric labels. It is a "high level" language and is intelligible to human beings. Object code is another level of computer language that, unlike source code, is incomprehensible to human beings. Object code is a machine language that employs binary numbers consisting of a string of "0's" and "1's." Many computer programs are written in source code but then distributed in object code form. A computer program known as a "compiler" is used to translate or convert source code into object code.

The object of such copyright protection is, as follows from Article 9.2, not the idea on which the computer software is based, but the expression of that idea through the object code or source code.

2. History of the provision

2.1 Situation pre-TRIPS

Prior to TRIPS, computer programs already enjoyed copyright protection in a significant number of countries. For example, in the United States, computer programs have been protected by copyright, as confirmed in 1976 when the Copyright Act was amended to expressly acknowledge that computer programs are within the subject matter scope of protection. Similarly, in 1991 the European Community Directive on the Legal Protection of Computer Programs[66] ("EC Software Directive") required member countries to extend copyright protection to computer programs.[67] Indeed, by 1991, at least 54 countries recognized copyright protection in computer programs. While most did so through legislative amendment, a few took place through executive proclamations or judicial decisions that extended the existing copyright laws to computer programs.[68]

2.2 Negotiating History

As with other provisions, Article 10 was the subject of several different proposals. With regard to computer programs, earlier drafts of Article 10.1 reflected a struggle over a compromise agreement on what precisely the scope of such a provision might be.

2.2.1 The Anell Draft

> "2. Protectable Subject Matter
>
> 2.1 PARTIES shall provide protection to computer programs [,as literary works for the purposes of point 1 above,] [and to databases]. Such protection shall not extend to ideas, procedures, methods [, algorithms] or systems.
>
> 2.2B.1 For the purpose of protecting computer programs, PARTIES shall determine in their national legislation the nature, scope and term of protection to be granted to such works.

[66] Council Directive of 14 May 1991 on the Legal Protection of Computer Programs, 1991 O.J. (L-122) 42.

[67] Article 1(1).

[68] See Michael S. Keplinger, *International Protection for Computer Programs* 315 PLI/Pat 457 (1991).

2.2B.2 In view of the complex legal and technical issues raised by the protection of computer programs, PARTIES undertake to cooperate with each other to identify a suitable method of protection and to evolve international rules governing such protection."

In the above draft, there was no independent provision on databases, unlike under the current Article 10 (see Chapter 9). The first paragraph had its origin in a Japanese proposal suggesting the following language:

"The copyright protection for computer program works under the present Agreement shall not extend to any programming language, rule or algorithm use for making such works."[69]

This proposal was modified later to conform more closely to Section 102 of the 1976 U.S. Copyright Act which provides that

"copyright protection for an original work of authorship [does not] extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery regardless of the form in which it is described, explained, illustrated, or embodied in such work."

The former Japanese proposal was taken over into the Brussels Draft (as quoted below), but ultimately removed from the context of computer programs and interposed, instead, as a general rule distinguishing copyrightable and non-copyrightable subject matter. This is the rule now embodied in Article 9.2 discussed in Chapter 7.

2.2.2 The Brussels Draft

This draft in its first paragraph contained essentially the same language as the current Article 10.1, but the term "literary" was still bracketed. The final agreement to protect computer programs as "literary" works has important implications for the scope of protection. Without such express reference, Members would be free to qualify computer software as works of applied art or an equivalent thereof, instead.[70] As such, the protection of computer programs could be less wide than the protection of "literary" works in the narrow sense of the term. The reason for this is that Article 2(7) of the Berne Convention makes the protection of works of applied art dependent on domestic legislation, which may determine the extent to which and the conditions under which such works are to be protected. In addition to that, Article 7(4) of the Berne Convention exempts, *inter alia*, works of applied art from the general term of protection (i.e. the author's life plus 50 years) and sets up a minimum term of only 25 years from the making of the work.

In addition to that, the first paragraph of the draft contained a bracketed second sentence providing that:

"[Such protection shall not extend to ideas, procedures, methods of operation or mathematical concepts.]"

[69] See Teruo Doi, *The TRIPS Agreement and the Copyright Law of Japan: A Comparative Analysis*, Journal of the Japanese Group of AIPPI (1996).

[70] See Gervais, p. 81, para. 2.60.

This was an amended version of the former Japanese proposal as referred to above, which was subsequently (i.e. after the Brussels Draft) taken out of the computer-related draft provision and put into a more general form under Article 9.2.

The third difference with respect to the current Article 10.1 was that paragraph 1 of the Brussels Draft proposal contained a second sub-paragraph on the compliance with certain procedures as a requirement for the protection of computer programs. This bracketed provision read as follows:

> "[This shall not prevent PARTIES from requiring, as a condition of protection of computer programs, compliance with procedures and formalities consistent with the principles of Part IV of this Agreement or from making adjustments to the rights of reproduction and adaptation and to moral rights necessary to permit normal exploitation of a computer program, provided that this does not unreasonably prejudice the legitimate interests of the right holder.]"

This proposal was not taken over into the final version of Article 10.1. Its first semi-sentence is very similar to the current Article 62, which is however not limited to copyrights in computer programs but applicable to all categories of IPRs covered by TRIPS.[71] The second part of the proposed paragraph, referring to adjustments to certain rights for the normal exploitation of a computer program, was entirely dropped.

3. Possible interpretations

The public policy interest in encouraging the creation of computer programs does not necessarily require protection solely in the form of copyright. Article 10 requires that copyright protection be extended to computer programs. However, TRIPS does not preclude additional forms of protection for computer programs. Thus, under TRIPS, a Member could offer patent, copyright and trade secret protection for computer programs.[72] In such a case, the author can choose which form of protection is most desirable assuming of course that, in the case of software patents, the higher standards of creativity required by patent law are also satisfied.

It should be noted that the possibility of alternative forms of protection for computer programs were contemplated prior to TRIPS, and such alternatives do exist in some national laws.[73] What TRIPS does require, though, is that one of the options for legal protection is in the form of copyright law.

[71] For more details on Article 62 of the TRIPS Agreement, see Chapter 30.

[72] One could argue that TRIPS Article 27.1, which prohibits field specific exclusions of patentable subject matter, requires that Member States recognize patent protection for software related invention so long as the invention satisfies the other requirements for patentability. See J.H. Reichman, *Universal Minimum Standards of Intellectual Property Protection Under the TRIPS Component of the WTO Agreement*, 29 International Lawyer 345, 360 (1995). More clearly, TRIPS Article 39, which requires protection for undisclosed information, offers a trade secret regime as an alternative to copyright protection for software. Note that because of the mandatory language of Article 10.1, Member States must provide copyright protection for computer programs. However, an innovator may opt for protection under the trade secret laws instead. This outcome is acceptable under TRIPS.

[73] See the U.S. Supreme Court decision *Diamond v. Diehr*, 450 U.S. 175 (1981) which paved the way for legal recognition of the patentability of software. Most recently, the controversial decision

TRIPS does not define, however, the eligibility criteria that Members must apply to computer programs, nor, apart from a generalized exclusion of ideas, procedures, methods of operation or mathematical concepts as such (Article 9.2), does the Agreement concern itself with the scope of copyright protection for this subject matter. Meanwhile, the software industry keeps evolving at a rapid pace, as does litigation in some countries concerning copyright protection of computer programs.[74]

TRIPS allows for reverse engineering of computer programs by honest avenues. This means that, although wholesale copying of computer programs is prohibited, the practice of re-implementing functional components of a protected program in "clones" is not. Programs that are independently coded and that yet deliver essentially the same functional performance or behaviour as the originator's own software do not infringe the latter's rights.[75] This may boost competition and innovation by firms in all countries, including in developing countries where some capabilities for the production of software already exist.

This distinction in Article 9.2 between protectable expressions on the one hand, and non-protectable ideas on the other, has been implemented differently at the national level, as may be illustrated by the U.S. approach to computer programs and the EC Software Directive. Under the Directive, the licensor cannot restrict a person's right to observe, study or test the way a program functions in order to obtain an understanding of the ideas embodied in the program, so long as the person doing so is engaging in permitted activity. In certain circumstances, the Directive also recognizes the right of a person who is a rightful owner of the work to decompile (i.e., translate object code into source code) the program to obtain information for purposes of ensuring interoperability with another computer program.[76] This right is circumscribed by the caveat that the information is not available elsewhere.[77] These rights do not have counterparts in the U.S. copyright law, although judicial decisions have often resulted in the same outcome. Inevitably, the scope of copyright protection for computer programs will, for the time being, continue to remain flexible and dependent on the interpretation and application given by national courts.

With respect to limitations or exceptions on the scope of protection for computer programs, there is some considerable divergence in the practices of major producers of software such as the United States and the European Union. The

in *State Street Bank & Trust Co. v. Signature Fin. Group*, 149 F. 3d 1368 (Fed. Cir. 1998) confirmed the patentability of business method software patents.

[74] On this and the following two paragraphs, see UNCTAD, *The TRIPS Agreement and Developing Countries*, New York and Geneva, 1996, paras. 181–183.

[75] Recall that the object of copyright protection in a computer program is not the underlying idea, but the computer language (i.e. source code or object code, see above, Section 1.) used to express that idea. The critical issue is that the coding of the program was carried out *independently*. In that case, the idea underlying the program is expressed in a way that differs from the way in which the originator of the program has expressed this idea. The new code thus constitutes the expression (of the underlying idea) that may only be attributed to the person having reverse engineered the original program. It is thus the independence of the expression (i.e. the code) that matters, not the similarity of the result.

[76] See EC Software Directive, Article 6.

[77] *Id*. Article 6(1).

differences are most evident with regard to the issue of reverse engineering. Reverse engineering may take place for a variety of purposes including research and the facilitation of compatibility (interoperability) to produce competing software, or software related products. Regardless of its purpose, the process of reverse engineering implicates the reproduction rights of the owner of the original computer program. In the United States, the appropriateness of a particular act of reverse engineering is a matter of judicial determination. U.S. domestic courts examine this practice on a case-by-case basis. In the European Union, however, reverse engineering is regulated by the Software Directive. This has led to distinct policies.

In the United States, for example, courts have held that reverse engineering of software is permissible under certain conditions.[78] These conditions are evaluated under the rubric of general limitations to copyright such as the fair use doctrine. Consequently, the underlying purpose of the use is of considerable importance in these cases. Reverse engineering for purposes of research is likely to yield favourable decisions to the defendant. Indeed, many commentators view this as an important policy tool in copyright law and that such purposes animate the objectives of having a copyright system in the first place.[79] Reverse engineering in efforts to create compatible software has also been deemed permissible by courts in the United States.[80]

By contrast, Article 6 of the EC Software Directive conditions decompilation (reverse engineering) for compatibility purposes on the fact that the information necessary to accomplish compatibility must not have been previously readily available. Further, decompilation is to be confined to the aspects of the program related to the need for compatibility. Reverse engineering for purposes of creating competing products is prohibited. There is no specific exception for research, and the limited scope of decompilation permitted by the terms of the Directive is not to be construed in a manner that would unreasonably interfere with the owner's normal exploitation of the computer program.

It could be concluded that once the issue of copyrightable elements of a program has been decided, some deference to domestic policies that permit activities such as reverse engineering or "back-up" or "archival" copies will be acceptable under TRIPS so long as these exceptions are reasonably consistent with the mandate for protection. The scope of these limitations arguably could be challenged under TRIPS Article 13 (see Chapter 12), which requires that WTO Members limit the nature and scope of exceptions to copyright. However, Article 13 does not relate to the question of what is copyrightable but, instead, to the exceptions and limitations to the copyright in the protected work. In terms of what aspects of a computer program are copyrightable, domestic courts still have the task of distinguishing idea from expression; TRIPS does not provide any explicit rules on

[78] See e.g., *Sega Enterprises Ltd. v. Accolade, Inc.*, 977 F.2d 1510 (9th Cir. 1992).

[79] See Lawrence D. Graham & Richard O. Zerbe, Jr., *Economically Efficient Treatment of Computer Software: Reverse Engineering, Protection and Disclosure*, 22 Rutgers Computer & Tech. L. J. 61, 67 (1996).

[80] See *Sega Enterprises, 77 F. 2d 1510; Atari Games Corp. v. Nintendo of America Inc.*, 30 U.S.P.Q. 2d 1401 (N.D. Cal. 1993).

what constitutes "expression" in computer programs. Consequently, there is some flexibility available to countries to determine the extent of copyright protection in a particular computer program.

Finally, software producers may also benefit from provisions in TRIPS requiring WTO Members to protect undisclosed information and to repress unfair competition. For example, once domestic laws to protect undisclosed information are enacted in conformity with Article 39, a local competitor whose conduct violates its provisions may become unable to profit from the improper acquisition of know-how that copyright laws may otherwise have left unprotected.[81] Similarly, the unfair competition norms incorporated into TRIPS through Article 10*bis* of the Paris Convention prevent competitors from copying trademarks or trade dress even though they may otherwise imitate non-copyrightable components of foreign computer programs.

4. WTO jurisprudence

To date, there is no WTO panel decision on this subject.

5. Relationship with other international instruments

The Berne Convention does not explicitly mention computer programs in its illustrative list of copyright works. Consequently, the first international treaty to do so is TRIPS. In 1996, two additional copyright treaties were negotiated under the auspices of the World Intellectual Property Organization (WIPO). These treaties, namely the WIPO Copyright Treaty (WCT) and the WIPO Performances and Phonograms Treaty (WPPT), were directed specifically to the effects of the digital revolution on copyright.

The WCT is a special agreement as defined in Berne Convention Article 20 ("The Governments of the countries of the Union reserve the right to enter into special agreements among themselves, in so far as such agreements grant to authors more extensive rights than those granted by the Convention, or contain other provisions not contrary to this Convention . . . "). By its own terms, the WCT has no connection with any other treaties but the Berne Convention.[82] Nonetheless, the WCT is not to be interpreted as prejudicing any rights and obligations under other treaties.[83] This suggests that for nations that have ratified both the WCT and TRIPS, the two agreements should be implemented and interpreted consistently.

With regard to computer programs, the WCT is the second international treaty to explicitly address copyright protection. WCT Article 4 states: "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." The reference to the Berne Convention suggests that, as a matter of international law, the requirements for copyright works under Berne Convention Article 2 will apply, *mutatis mutandis*, to computer programs

[81] Know-how is not an expression, but an idea, and thus not eligible for copyright protection.

[82] See WCT, Article 1(1).

[83] Id.

protected under the provisions of the WCT. Thus, even though the WCT does not explicitly mention the idea/expression dichotomy, it is reasonable to assume that the idea/expression principle extends to the scope of copyright protection recognized for computer programs by WCT Article 2. The combined legal force of TRIPS Article 10 and WCT Article 4 confirms that computer programs are firmly established as copyrightable subject matter under international copyright law. As the previous discussion indicates, however, this confirmation does not mean that all countries protect computer programs in the same way and to the same extent.

6. New developments

6.1 National laws

A large cross-section of countries had already extended copyright protection to computer programs prior to the negotiation of TRIPS. Consequently, many countries were already in compliance with Article 10 with respect to the availability of copyright protection for computer programs. However, differences in protection remain, as is particularly evident in the scope of exceptions or limitations to protection. For example, judicial decisions in the United States suggest that software structure, sequence and organization are protectable under copyright law.[84] Other countries have not clearly determined that this is the case under their legislation. In addition, TRIPS requires that computer programs be protected as literary works for a term of the life of the author plus 50 years.[85] Those countries which, prior to TRIPS, accorded a lesser term of protection for computer programs must modify their laws to be compliant with the term requirements of TRIPS.

An issue not addressed under TRIPS is the use by copyright holders of encryption technologies.[86] In this context, it is noteworthy that the U.S. 1998 Digital Millennium Copyright Act (DMCA), implementing the WCT, makes illegal those acts circumventing encryption technologies, even in cases traditionally considered legal under the fair use exception.[87] This kind of approach to encryption is by no means mandatory either under TRIPS or under the WCT. Developing countries are free to deny protection to encryption technologies when these are used to prevent certain public policy goals, such as distance learning.

In addition to the move to support encryption practices through copyright, some industries in certain countries are pressing their governments to pass legislation even *requiring* computer manufacturers to integrate into their products particular devices technically preventing the copying of protected works without the author's consent.[88] However, no such legislation has so far been enacted.

[84] *Whelan v. Jaslow*, 797 F. 2d 1222 (3d Cir. 1986). See also Dennis S. Karjala, *The Relative Roles of Patent and Copyright in the Protection of Computer Programs*, 17 John Marshall J. of Computer & Information L., 41, 53 (1998) hereinafter Karjala.

[85] As required by the Berne Convention, Article 7(1).

[86] "Encryption" is "a procedure that renders the contents of a computer message or file unintelligible to anyone not authorized to read it. The message is encoded mathematically with a string of characters called a *data encryption key*. [. . .]" (See J. Friedman (ed.), *Dictionary of Business Terms*, third edition 2000, p. 220).

[87] See IPR Commission report, p. 107, referring to the above U.S. law.

[88] See the IPR Commission report, p. 107.

6.2 International instruments

As opposed to TRIPS, the WCT does address the issue of encryption: Article 11 WCT (Obligations concerning Technological Measures) provides that:

> "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 under this Treaty or the Berne Convention and that restrict acts, in respect of their works, which are not authorized by the authors concerned or permitted by law."

The language employed in this provision offers quite a bit of flexibility as to implementation. What is "adequate" legal protection is to be determined by national legislation, according to national preferences. It is important to note that this provision does not obligate countries to protect encryption technologies in any given case. The last part of Article 11 makes clear that the case of unauthorized use (i.e. without agreement from the author) is not the only one in which encryption may be supported by national copyright law. Instead, countries may limit such support to cases where the use of the protected material is not permitted by law, irrespective of the will of the author. It is thus up to the domestic legislator and national preferences to judge in which degree encryption technologies are justified, and to which extent cases of fair use should prevail.[89] Countries may opt for quasi-absolute copyright protection by condoning encryption technologies whenever the author does not wish to provide free access to certain works. Alternatively, they may deny the support of encryption technologies through copyright law if circumvention serves certain public policy objectives such as education and technology transfer.

7. Comments, including economic and social implications

The market for computer programs is characterized by what many economic commentators refer to as network effects. Simply put, this means that the software market is one where the value of the product increases as the number of people who purchase it also increases. For example, communication technologies such as the telephone or fax machine are generally very susceptible to network effects. Consider that if only one person purchased a telephone or a fax machine, the value of either product would increase as other people purchased the same products. Conversely, the values could decline to nothing if only one person owned a telephone or a fax machine.

Similarly, the market for software that runs on a computer operating system is subject to network effects. This problem has important implications for the diffusion of computer programs. Operating systems have an "interface" that encompasses the way in which computer modules communicate. Computer programs for an application must be written in a way that allows it to run on a particular operating system. The more applications that run on a particular operating system, the more valuable that system becomes. As more applications are written by software developers, more consumers are likely to purchase it because of the variety

[89] On fair use see Chapter 12, Article 13, TRIPS Agreement.

of applications available for that particular operating system. As more consumers purchase it, more applications will be developed, and so on. This positive feedback effect gives some understanding of why dominant software firms emerge. To encourage competition in the software industry, there must be careful attention paid to the precise features of software that are protected by copyright.

For example, some commentators argue that certain "internal" interfaces should not be protected by copyright because they are essentially nothing more than "industrial compilations of applied know-how."[90] The central focus of arguments against the copyrightability of computer interfaces is that interfaces *must* be used for computer programmers to write programs that can run on the operating system. If these kinds of interfaces are excluded from copyright, then competitors will be free to use the interface to develop a competitive product, which is an important aspect of promoting the public interest. User interfaces that produce computer screen displays are more likely to be subject to copyright under a number of different categories. Such displays might constitute pictorial works (e.g., video game characters) or literary works (e.g., help screens).[91]

The importance of computer programs to modern life makes the economic and social implications of protection an important issue for all countries. As discussed above, the important issue is to "abstract" the idea of the program from its expression to ensure that copyright protection is not being used to acquire more rights than the system otherwise permits. Additionally, some countries recognize three general limitations or exceptions to the copyright in computer programs. These are (i) exceptions for "back-up copies"[92]; (ii) exceptions to foster access to the non-copyrightable elements of the computer program such as "reverse engineering";[93] (iii) exceptions to facilitate interoperability. Properly delineated exceptions in the last two categories have important ramifications for competition and diffusion.

A country with a young software industry may wish to consider strong protection for copyrightable elements to encourage investment in the development of software. As the industry matures, however, it is important to foster competition by allowing certain uses that would facilitate further research and development and ensure that the market is not unduly dominated by the first mover. Such market dominance may have particularly serious repercussions in developing countries,

[90] See Pamela Samuelson et al., *A Manifesto Concerning the Legal Protection of Computer Programs*, 94 Columbia Law Review, 2308 (1994).

[91] See Karjala, at 55.

[92] For example, under the EC Software Directive, a person has the right to make a back-up copy of the computer program. Also, the Czechoslovakian copyright law of 1990 permitted users to make back-up copies of a computer program without permission from the owner and without a duty to pay remuneration. Finally, Article 7 of the Brazilian Law of 1987 excluded from infringement, "the integration of the program within an application solely for the use of the person making the integration".

[93] As to the legality of reverse engineering under TRIPS and as to its domestic implementation, see above, under Section 3. Note, however, that *independent* efforts to develop computer programs that meet local industrial and administrative needs may sometimes pay bigger dividends than re-implementing foreign products, which is generally a costly endeavour requiring high technical skills. The potential benefits of obtaining the most up-to-date software by means of direct investment, licensing or other arrangements should always be weighed against re-implementation (in the sense of reverse engineering) of existing software. See UNCTAD, 1996, para. 184.

where high prices charged by a monopolist would exclude most parts of the population from the purchase of the copyrighted software. In this respect, the Commission on Intellectual Property Rights favours an active promotion through developing country governments and their donor partners of low-cost software products.[94]

On the positive side, computer software offers important opportunities for countries already having acquired a certain level of technological capacity to close the knowledge gap *vis-à-vis* industrialized countries. Computer-related technologies are the principal means of accessing information and furthering technology transfer.[95] The possibility of charging higher prices for copyrighted computer software may also have the positive effect of encouraging the development of local industries producing software that is better adapted to local conditions. This may eventually increase developing countries' participation in the world market of computer software, which is currently very modest.[96] Thus, the cost-benefit ratio of reinforced protection would have to be judged both in terms of impact on the diffusion of computer technology, including in particular for educational purposes – and on the improved opportunities given to local producers, who would not be able to start up and grow if they were victims of the inexpensive and easy-to-make copying of their products.[97]

The problem of access barriers through strengthened copyright protection arises in particular with respect to the Internet. The world wide web is a major medium for distance learning, considering that providing Internet access is less costly than the setting up of entire libraries.[98] On the other hand, works published on the Internet (e.g. scientific articles) are increasingly protected from free access through new technologies such as encryption. This practice denies Internet users the access to certain websites, even if such access would be limited to private (e.g. learning) purposes.[99]

Therefore, developing countries should be very careful about condoning encryption technologies which would prevent free access to on-line documents essential to the dissemination of knowledge, including distance learning. This would inhibit developing countries' efforts to close the technology gap towards developed

[94] See IPR Commission report, p. 105. For this purpose, the Commission recommends that developing countries and their donor partners review their software procurement policies "with a view to ensuring that options for using low-cost and/or open source software products are properly considered and their costs and benefits are carefully evaluated." (ibid.). "Open source" software refers to the source code of a computer program, which is, other than the object code, comprehensible to human beings (see above, Section 3.). According to the IPR Commission, another way of promoting competition with a view to ensuring affordable software prices is to limit the protection of computer programs to the object code, making the source code available to developing country software industries.

[95] See IPR Commission report, p. 104.

[96] See UNCTAD, 1996 (paras. 170-172), responding to the concern that due to actual market shares, strengthened software protection is likely to improve developed countries' market positions *vis-à-vis* developing countries.

[97] Ibid., para. 172.

[98] See IPR Commission report p. 107.

[99] See IPR Commission report, p. 106.

countries. Accordingly, the Commission on Intellectual Property Rights has recommended that:

> "Users of information available on the Internet in the developing nations should be entitled to 'fair use' rights such as making and distributing printed copies from electronic sources in reasonable numbers for educational and research purposes, and using reasonable excerpts in commentary and criticism. Where suppliers of digital information or software attempt to restrict 'fair use' rights by contract provisions associated with the distribution of digital material, the relevant contract provision may be treated as void. Where the same restriction is attempted through technological means, measures to defeat the technological means of protection in such circumstances should not be regarded as illegal. Developing countries should think very carefully before joining the WIPO Copyright Treaty and other countries should not follow the lead of the US and the EU by implementing legislation on the lines of the DMCA or the Database Directive."[100]

In addition to specific legislative exceptions, such as those in the EC Software Directive, it is possible that other general copyright limitations could also be extended to computer programs. Thus, a country could choose to identify explicit limitations in its copyright law, while also allowing courts to extend the generalized limitations on other copyright works to computer programs as well.

In sum, copyright protection of computer programs, like copyright protection in general, gives rise to the same concern about striking the right balance between the encouragement of intellectual activity on the one hand and the free availability of certain documents for public policy purposes on the other.

[100] See IPR Commission report, p. 109.