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A Comparative Analysis Of The Patentability Of Computer Software Under The Trips Agreement: The U.S., The E.U., And Turkey

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ABSTRACT

The question of how to protect new intellectual creations, which emerged as a consequence of the developments in information technologies, brings about substantial debate. Undoubtedly, one of the most controversial issues in this area is the matter of which form of intellectual property protection is appropriate for computer programs. Although copyrights and patents are the two possible intellectual property forms under which computer programs might be protected, countries take different attitudes in this field depending on their level of advancement in the sector. The current international consensus on this subject is that copyright protection provided under TRIPS Agreement is most appropriate. Nevertheless, since there is no provision in the TRIPs agreement that prevents the patentability of computer programs, these creations could also be a subject matter of patents.

ÖZET

Bilgi teknolojilerinde yaşanan gelişmeler sonrasında ortaya çıkan yeni bir takım fikri ürünlerin nasıl korunacağı sorusu bir takım tartışmaları da beraberinde getirmektedir. Bu alanda en çok tartışılan konulardan bir tanesi şüphesiz bilgisayar

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programlarının hangi fikri mülkiyet çeşidi altında korunacağı hususudur. Bilgisayar programlarının telif ya da patent hakkı altında korunması iki ihtimal olarak ortaya çıkmakla birlikte, sektördeki gelişmişlik düzeylerine bağlı olarak çeşitli ülkelerce farklı tutumlar sergilenmektedir. Hali hazırda uluslararası arenada kabul edilen temel uygulama TRIPS Anlaşması'nda ifadesini bulan telif hakkı korumasıdır. Ancak, TRIPS Anlaşması'nda bilgisayar programlarının patentlenmesini engelleyen bir hükmün bulunmaması nedeniyle, bu yaratımların patent konusu olabileceği ileri sürülmektedir.

Keywords: *Computer programs, software patents, TRIPS Agreement, software-related inventions, software patents in the US, software patents in the EU, software patents in Turkey.*

Anahtar Kelimeler: *Bilgisayar programları, yazılım patentleri, TRIPS Anlaşması, yazılımlarla ilgili buluşlar, ABD'de yazılım patentleri, AB'nde yazılım patentleri, Türkiye'de yazılım patentleri.*

INTRODUCTION

As new technologically-oriented intellectual creations emerge, the following inevitable questions come before intellectual property policy makers: what type of intellectual property protection is appropriate? What should the scope of protection be? How can the social benefits of these intellectual creations be maximized while granting exclusive rights to creators/owners over their creations at the same time? The answers to these questions become increasingly complex when new types of intellectual creations, such as computer programs, do not exactly fit within the forms of heretofore classical intellectual property.[2]

Copyrights and patents are the two main intellectual property forms under which computer software[3] might be protected.[4] Generally, copyright laws protect original expression against direct copying, but not the idea itself.[5] With

[2] J.H Reichman, T*he Know-How Gap in the TRIPS Agreement: Why Software Fared Badly, and What Are the Solutions*, 17 HASTINGS COMMUNICATIONS & ENTERTAINMENT LAW JOURNAL, 763, 766 (1994-1995).

[3] Computer software is a term used solely to refer to computer programs. This article will used both terms interchangeably.

[4] Aaron D. Charfoos, *How Far Have We Come, and Where Do We Go From Here: The Status of Global Computer Software Protection Under the TRIPS Agreement*, 22 NORTHWESTERN JOURNAL OF INTERNATIONAL LAW & BUSINESS 261, 264 (2002).

[5] EU Parliament, Directorate-General for Research Working Paper, *The Patentability of Computer Programs Discussion of European-level Legislation in the Field of Patents for Software*, at 7

regards to software, both the source code (human readable form) and object code (machine readable form) qualify for copyright protection.[6] The problem of protecting copyright is that although the object code exists as written text, it serves a utilitarian function which is traditionally protected by patents.[7] Therefore, copyright cannot prevent second comers from recreating the same work or producing similar work using different expression.[8] In other words, there is no copyright infringement when a competitor uses the same idea in constructing his/her work provided that his/her creation is independent.

As opposed to copyright, patents grant limited monopoly to the patent holders on their inventive ideas. Patent protection can be invoked even against the inventors of the same idea.[9] However, in the field of computer programs, patentability is highly controversial. There is an intense debate about whether the benefit of patents outweighs the costs with respect to software patents. The common arguments in favor of patent protection for computer software are the promotion of investment and the highly technical nature of software. In contrast, opponents emphasize the negative effects of software patents on open source developers and disproportionately on small and medium software enterprises. The anticompetitive impact of software patents through the exclusion of competitors in the industry and the high price that the monopolist will be able to charge consumers and users are other reasons against patent protection.[10]

Given this situation, countries often disagree about the type and scope of IP protection for computer programs, reflecting their varying stages of economic development and divergent interests.[11] In particular, prior to the Trade Related

(2002). *available at* http://www.europarl.eu.int/meetdocs/committees/juri/20020619/Software Patent.pub.pdf (last visited May 10, 2007).

[6] Fenwick & West LLP, *2004 Report on International Legal Protection for Computer Software*, 21 COMPUTER & INTERNET LAW 1, at 1 (2004) [hereinafter "Fenwick"].

[7] Dennis S. Karjala, *The Relative Roles of Patent and Copyright in the Protection of Computer Programs*, 17 JOHN MARSHALL JOURNAL OF COMPUTER & INFORMATION LAW 41, 47 (1998).

[8] EU Parliament, *supra* note 5, at 7.

[9] EU Parliament, *supra* note 5, at 7.

[10] Robert Hart, *et al*,, *The Economic Impact of Patentability of Computer Programs Report to the European Commission*, 28, *available at* http://europa.eu.int/comm/internal_market/en/indprop/comp/study.pdf (last visited May 10, 2007).

[11] Fenwick, *supra* note 6, at 5.

Aspects of Intellectual Property Rights (TRIPS) Agreement,[12] the status of computer program protection was undefined under the Paris Convention, which regulates global patent rights, and was controversial under the Berne Convention, which regulates the worldwide copyright regime. The TRIPS Agreement places computer programs under the copyright section by stating that "computer programs, whether in source or object code, shall be protected as literary works under the Berne Convention."[13] Furthermore, TRIPS mandates that all member states create an adequate judicial and administrative enforcement mechanism and provide a dispute resolution mechanism not only for the protection of computer programs but all intellectual property rights.[14]

Despite the TRIPS Agreement, the question of whether or not computer programs can be patented has not been solved. Article 27 of the agreement states that "… patents shall be available for any inventions…in all fields of technology, provided they are … capable of industrial application."[15] While the second and third paragraphs of the same article allow member states to exclude from patentability some categories such as medical treatment, or inventions dangerous to health or environment, it makes no mention of computer programs.[16] By not commenting on the viability of software patents, TRIPS leaves this decision to the individual signatories.[17] However, even the developed countries differ as to whether computer programs should be patentable, and if so, which limitations should apply.[18]

The U.S. position on the patentability of software is one of the most liberal among the developed countries. Under U.S. patent law, "[w]hoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, … may obtain a patent …."[19] Nevertheless, the U.S. Supreme Court excluded "laws of nature, natural phenomena, and abstract ideas" from patent

[12] Marrakesh Agreement Establishing the World Trade Organization, Annex 1C: Agreement on Trade Related Aspects of Intellectual Property Rights, 15 April 1994 (TRIPS) available at http://www.wto.org/ english/docs_e/legal_e/27-trips.pdf (last visited Jun. 3, 2007)[hereinafter "TRIPS"].

[13] Reichman, *supra* note 2, at 775.

[14] TRIPS, *supra* note 12, Arts 41-64; Reichman, *supra* note 2, at 765.

[15] TRIPS, *supra* note 12, Art 27.

[16] TRIPS, *supra* note 12, Art 27; Reichman, *supra* note 2, at 769.

[17] Charfoss, *supra* note 4, at 280.

[18] Fenwick, *supra* note 6, at 5.

[19] 35 U.S.C. § 101.

protection.[20] Before 1981, the United States Patent and Trademark Office (USPTO) treated computer programs and inventions relating to computer programs as mathematical algorithms or abstract ideas and did not grant patents. Attitudes towards software patents have changed significantly following *Diamond v. Diehr*, in which the Supreme Court stated that a patent claim could not be denied solely because the invention uses "…a mathematical formula, computer program, or digital computer."[21] Today, the U.S. grants patents for a wide range of computer software-related inventions[22] provided that they produce "concrete, useful and tangible" results.

The EU's position on the protection of computer programs is somewhat different from that of the U.S. Although paragraph 2 of Article 52 of the European Patent Convention (EPC)[23] explicitly excludes computer programs from patentability, paragraph 3 of the same article states that all items listed in paragraph 2 are only excluded from patentability "as such."[24] The term "as such" means that, like other parts of paragraph 2, computer programs are open to patent protection. The current practice of the European Patent Office is to grant patents to computer program-related inventions if those programs produce a technical effect which goes beyond the normal physical interaction between the computer program and the computer.[25]

In order to harmonize the applications of EU member states, the European Commission proposed a "Directive of the European Parliament and of the Council on the Patentability of Computer-implemented Inventions" in February 2002.[26] The aim of the proposed Directive was to grant patent protection to computer-implemented inventions provided that they are new, susceptible to industrial application, and involve an inventive step.[27] That proposal however

[20] Diamond v. Diehr, 450 US 175, 185 (1981).

[21] *Diamond*, 450 US at 187.

[22] The terms "computer-implemented invention," "software-enabled invention," "software-operated invention," and "computer program-related inventions" are also used to convey the same meaning.

[23] European Patent Convention (EPC), available at http://www3.european-patent-office.org/dwld/epc/epc_2002_v1.pdf (last visited May 11, 2007).

[24] EU Parliament, *supra* note 5, at 8.

[25] EU Parliament, *supra* note 5, at 9.

[26] Proposal For a Directive of the European Parliament and of the Council on the Patentability of Computer-implemented Inventions [hereinafter "Proposed Directive On the Patentability of Computer-implemented Inventions"], Official Journal C 151 E, Jun. 25, 2006.

[27] *Id*., Art 4.

became a major focus for conflict, not only between the member states but also between the Council and Parliament. Following several years of debate, the proposal was rejected by the European Parliament by an overwhelming majority (648 to 14) in a vote on 6 July 2005.[28] Under the co-decision procedure, the legislative process ended with this rejection and the proposed directive did not become law in any form. Therefore, member countries are free to maintain their own practices.

Turkey, which is not yet an EU member but began membership talks on 3 October 2005, excludes computer programs from patent protection according to Article 6 of its "Decree Law No. 551 Pertaining to the Protection of Patent Rights."[29] Nevertheless, its attitude towards the patentability of computer programs is very similar to that of the EU. Turkey also put the EPC into effect on 1 November 2000. Therefore, like the application in the EU, software-related inventions can be patented in Turkey provided that they are related to a machine or process and bear all patentability requirements.[30] It is highly probable that the ongoing discussion in the EU will affect the Turkey's approach significantly.

This article examines the patentability of computer programs under the TRIPS Agreement and tries to explain the pros and cons of patent protection for computer programs. Then it assesses the current applications in the U.S., in the EU, and in Turkey. Finally, the article attempts to determine the best approach for Turkey toward patentability of computer software, by taking into account the applications in the U.S. and the EU, which will affect international software protection in general, and applications in Turkey in particular.

In this context, Part I will provide general information regarding copyrights and patents; this part will also give an overview of international software protection both before the TRIPS Agreement. Part II will look at the current protection of computer software under the TRIPS Agreement. Part III will discuss the patentability of the computer programs under the TRIPS Agreement and also provides applications in the U.S. and the EU, which are important for further developments in the international arena. Part IV will examine the patentability of computer software in Turkey and discuss the future by taking into account the ongoing discussions on both sides of the Atlantic.

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[28] EU Parliament Daily Notebook, *No Directive on Software Patents*, available at http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+PRESS+DN-20050706-1+0+DOC+XML+V0//EN&language=EN#SECTION1 (last visited Jun 7, 2007).

[29] Decree Law No.551 pertaining to the protection of Patent Rights (Decree Law No 551), Art 6. *available at* http://www.turkpatent.gov.tr/mevzuat/PatentKhk.pdf (Turkish) (last visited May 11, 2007).

[30] Turkish Patent Institute, Note on Protection of Software, Unpublished note.

I. BACKROUND

A. Software and Intellectual Property Protection

Beginning in the 1970s, when increasingly complex and sophisticated computer programs began to be marketed independent from hardware, development in computer software industry gained extraordinary momentum. In parallel with the commercialization of computer programs, legal protection of these intellectual creations has become more important. Copyrights and patents are the two most appropriate intellectual property forms under which computer software might be protected.[31] To properly understand the current situation with regard to computer software, it is necessary to understand the scope of these IP forms, their aims and objectives.

1. Copyrights

Copyright protects original works of expression, such as novels, poems, plays, films, musical compositions, photographs, sculpture and computer programs by preventing people from copying or commercially exploiting them without the copyright owner's permission.[32] A work is eligible for copyright protection if it fulfills the criteria of originality and is fixed in a tangible medium of expression. The concept of originality is not equivalent to novelty; a work may be original even though it closely resembles other works, so long as the similarity is not the result of copying.

In this framework, second comers are free to use the ideas in the first author's copyrighted works provided that they articulate these ideas with their own expressions. In other words, copyright protection extends only to expressions of ideas and not to ideas, procedures, and methods of operation themselves.[33] Moreover, copyright protection does not depend on compliance with any formalities such as registration or deposit of copies.[34] Once the original expression of the author is fixed in a in any tangible medium, such as writings, notes, or electronic format, the resulting work is protected by copyright laws.

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[31] Charfoss, *supra* note 4, at 264.

[32] World Intellectual Property Organization (WIPO), INTRODUCTION TO INTELLECTUAL PROPERTY 154-55 (Kluwer Law International, 1997).

[33] *Id*., at 153.

[34] G. Gregory Letterman, BASICS OF INTERNATIONAL INTELLECTUAL PROPERTY LAW, 257 (Trans-national Publishers, 2000).

The rights protected by copyright can be divided into two categories: economic rights and moral rights.[35] Economic rights are rights of reproduction, public performance broadcasting, translation, adaptation, public recitation, public display, distribution, etc.[36] Moral rights are the rights concerned with protecting the integrity of the work and the reputation of the author. These rights include the author's right to object to any distortion, mutilation or other modification of his work that might be prejudicial to his honor or reputation.[37] Both sets of rights belong to the creator, who can freely exercise them. In exercising these rights, authors can use the work themselves or give permission to someone else to use the work or prohibit someone else from using the work.[38] In principle, the term of protection, provided by copyrights laws, is the creator's lifetime and a minimum of 50 years after his/her death.[39]

With regard to software, it is widely accepted among countries around the world that both the source code (human readable form) and object code (machine readable form) qualify for copyright protection.[40] Since copyrights only protect original expressions, not ideas, procedures, methods of operations or mathematical concepts, there is no copyright infringement when a competitor uses the same idea in constructing his/her program provided that his/her creation is independent. In this context, however, it is widely debated whether copyright is an appropriate form of protection for computer software.

It is argued that although computer programs appear as textual works, they are functional, at least in the object code form.[41] This functional aspect of computer programs causes the computer to perform certain tasks.[42] Moreover, computer programs have some other non-literal but valuable functional parts, such as program interfaces, and structure, sequence, and organization (SSO) that need to be protected.[43] In this context, many commentators have asserted that copyrights do not provide effective protection for these functional aspects

[35] *Id*., at 258.

[36] *Id.*

[37] *Id.*

[38] *Id.*

[39] *Id.*

[40] Fenwick, *supra* note 6, at 1.

[41] Karjala, *supra* note 7, at 47.

[42] *Id.;* Pamela Samuelson, et al, *A Manifesto Concerning the Legal Protection of Computer Programs*, 94 COLUMBIA LAW REVIEW 2308, 2316.

[43] Karjala, *supra* note 7, at 53-57.

of computer programs.[44] Moreover, competitors can imitate the functional elements of a program even if they can not access the source code of the program by decompiling the object code of the program or using other reverse engineering techniques. In this regard, patent protection emerges as an alternative to copyright protection.

2. Patents

According to the World Intellectual Property Organization (WIPO), "[a] patent is an exclusive right granted for an invention, which is a product or a process that provides a new way of doing something, or offers a new technical solution to a problem."[45] In order for an invention to be considered eligible for patent protection, it must fulfill the following conditions: novelty, inventive step, and usefulness. The novelty requirement necessitates some new characteristics not known in the body of existing knowledge, called "prior art", in its technical field.[46] The invention must show an inventive step, which requires that it must not be obvious to a person with ordinary skill in the field.[47] To meet the usefulness requirement, an invention must be of a kind which can be applied for practical purposes.[48]

Generally, patent protection is effective when a government office or a regional office, acting for several countries (for example the European Patent Office (EPO)), grants a patent after reviewing the application filed by the inventor.[49] In his/her application, the inventor must describe the invention in detail.[50] In addition, applications include various claims, particularly the information that determines the extent of the protection sought to be granted by patent.[51] Generally this process costs a lot of money, which includes attorney fees, patent draftsman charges, and governmental charges; it also takes a lot of time.[52]

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[44] *See generally Id.;* Samuelson, *supra* note 43.

[45] The World Intellectual Property Organization web site, *at* http://www.wipo.int/aboutip/en/about_ patents.html (last visited May 11, 2007).

[46] Letterman, *supra* note 35, at 165.

[47] *Id.*

[48] WIPO, *supra* note 33, at 125.

[49] *Id*., at 123.

[50] Letterman, *supra* note 35, at 167.

[51] *Id.*, at 167.

[52] *Id.*, at 170.

Upon the grant of patent, the inventor has a right to exclude others from making, using or selling his/her invention.[53] Thus, this exclusive right of making, using or selling the patented invention creates a quasi-monopolistic situation. For this reason, governments sometimes impose restrictions on these rights in the form compulsory licensing systems, which allow others to use those patents considered to be of "national significance" to the public health, policy or welfare of the country.[54] Moreover, the protection conferred by the patent lasts only a short time, generally 20 years, compared to copyright protection.

Regarding computer software, there is no common understanding among the countries on the patentability of these creations. There is an intense debate about whether the benefit of patents outweighs the costs with respect to software patents.[55] Although the patentability of pure computer software is highly controversial, many countries in the world grant patents to software-related inventions, at least to some degree.[56] Patentability of computer software and applications of the U.S., the EU and Turkey will be examined in detail in the following parts.[57]

B. Main International Intellectual Property Agreements before the TRIPS Agreement and the Status of Computer Software

1. Berne Convention

The Berne Convention, adopted in 1886, regulates worldwide copyright protection for literary and artistic works.[58] The Convention accomplishes this purpose by adopting three basic principles and by setting forth provisions determining minimum protection for these works. Under the national treatment principle, copyrighted works are protected on a non-discriminatory basis whether domestic or foreign works. Under the automatic protection principle, these works are protected without compliance formalities. Under the

[53] *Id.*, at 123.

[54] Anthony D'Amato and Doris Estelle Long, INTERNATIONAL INTELLECTUAL PROPERTY LAW 4 (Kluwer Law International, 1997).

[55] *See* software patent debate *infra*.

[56] Fenwick, *supra* note 6, at 4.

[57] *See* Part III and Part IV *infra*.

[58] "The Berne Convention, concluded in 1886, was revised at Paris in 1896 and at Berlin in 1908, completed at Berne in 1914, revised at Rome in 1928, at Brussels in 1948, at Stockholm in 1967 and at Paris in 1971, and was amended in 1979" (Berne Convention) *available at* http://www.wipo.int/ treaties/ en/ip/berne/trtdocs_wo001.html (last visited Jun. 3, 2007).

independence of protection principle, copyright protection is independent of the existence of protection in the country of origin of the work. In addition, the Convention also provides some minimum standards with regard to works and rights to be protected, and the duration (generally author's life plus 50 years) of the protection.[59]

Even though it was revised and amended several times between 1886 and 1979, the Berne Convention did not adopt any system relating to the ability to copyright computer software.[60] Therefore, this issue is left to the discretion of individual nations whether or not to protect such works under their copyright laws. Intensive international discussions took place regarding the protection of software during the 1970s and the first half of the 1980s.[61] These discussions tried to resolve the question of whether such protection should be provided under copyright law or patent law, or possibly under a *sui generis* system of protection.[62]

Although the WIPO, which administers the Berne and Paris Conventions, proposed a *sui generis* form of legal protection of computer programs adopted by some countries such as France and Korea, the US rejected this approach.[63] Instead, the U.S. decided to protect computer software as literary works under copyright laws.[64] Following the U.S. lead, the EU also took the same approach by adopting the Council Directive 91/250/EEC of 14 May 1991 on the Legal Protection of Computer Programmes"[65] that protect both source and object codes of computer programs as literary works. This cooperation between the

[59] *Id*. Art 7.

[60] Charfoss, *supra* note 4, at 265.

[61] WIPO, WIPO Intermediate Training Course On Practical Intellectual Property Issues In Business China, 2003, 2, *available at* http://www.wipo.int/sme/en/activities/meetings/china_most_03/wipo_ip_ bis_ge_03_7.pdf (last visited May 12, 2007).

[62] *Id.*

[63] Pamela Samuelson, *Challenges for the World Intellectual Property Organization and the Trade-Related Aspects of Intellectual Property Rights Council in Regulating Intellectual Property Rights in Information Age*, E.I.P.R 1999, 21(11), 528, at 530-531 (1999).

[64] Charfoss, *supra* note 4, at 266.

[65] Directive 91/250/EEC of 14 May 1991 on the Legal Protection of Computer Programmes, *available at* http://europa.eu.int/smartapi/cgi/sga_doc?smartapi!celexplus!prod! DocNumber&lg =en&type_doc=Directive&an_doc=1991&nu_doc=250 (last visited May 12, 2007).

two developed worlds led other countries to accept the same approach under the TRIPS Agreement.[66]

2. Paris Convention

The Paris Convention, which concluded in 1883 and was revised several times thereafter, was devised to provide worldwide protection for industrial property.[67] This Convention applies, not only to patents, but also to a wide range of industrial property rights which were defined in Article 1(2) as "patents, utility models, industrial designs, trademarks, service marks, trade names, indications of source or appellations of origin, and the repression of unfair competition."[68] Most of the provisions of the Convention fall under the three main categories: national treatment, right of priority, and common rules.

Under national treatment provisions, the Convention requires all member countries to provide the same protection to nationals of other contracting countries as it provides to its own nationals.[69] The Convention also provides for the right of priority rules for patents, utility models, marks and industrial designs. Regarding patents, this right means that, on the basis of a regular first application filed in one of the contracting States, the applicant may, within a certain period of time (12 months), apply for protection in any of the other contracting states; later applications will then be regarded as if they had been filed on the same day as the first application.[70] The Convention provides some common rules on the protection of various areas of industrial property. For example, Article 4bis states that patents granted in different contracting States are independent of each other.[71]

The international patent structure created by the Paris Convention has been criticized in several ways.[72] First, it fails to prescribe minimum standards for what is patentable.[73] Second, it fails to establish a minimum term of patent

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[66] TRIPS, *supra* note 12, Art 13, Charfoss, *supra* note 4, at 267.

[67] Paris Convention for the Protection of Industrial Property (Paris Convention), *available at* http://www.wipo.int/treaties/en/ip/paris/trtdocs_wo020.html (last visited May 10, 2007).

[68] *Id.*, Art 1(2).

[69] *Id.*, Art 2.

[70] *Id.*, Art 4.

[71] *Id.*, Art 4.

[72] Bankole Sodipo, PIRACY AND COUNTERFEITING: GATT TRIPS AND DEVELOPING COUNTRIES 197 (Springer, 1997).

[73] *Id.;* Charfoss, *supra* note 4, at 4.

protection, ranging from 5 to 20 years among member countries.[74] By leaving the minimum patent protection standards to the discretion of member countries in general, particularly regarding computer programs, the Paris Convention failed to establish a truly workable international patent protection structure.[75]

II. CURRENT COMPUTER SOFTWARE PROTECTION UNDER THE TRIPS AGREEMENT

The deficiencies of these two main conventions, particularly their lack of universal minimum standards and effective enforcement mechanisms, led major exporter countries of IP products, predominantly the US and European Union (EU), to pursue an alternative strategy to enhance the international protection mechanism.[76] These efforts played a central role in concluding the TRIPS Agreement, Annex 1C of The Marrakesh Agreement Establishing the World Trade Organization (WTO Agreement), which has successfully established a comprehensive set of international minimum standards for intellectual property rights.[77]

In creating a more comprehensive and stable system, TRIPS first incorporates many of the Berne and Paris Convention's provisions, upon which the countries had already agreed, by selective reference to them.[78] Second, TRIPS provides some other norms on subjects where these conventions are silent or inadequate, such as requiring WTO members to regulate the rental of sound recordings, computer programs, and motion pictures.[79] Finally, it requires all member states to maintain adequate levels of judicial and administrative enforcement mechanisms and establishes the Dispute Settlement Mechanism (DSM), one of the most important accomplishments of the TRIPS Agreement. [80]

Concerning computer program protection, TRIPS made significant improvements over the pre-TRIPS period international agreements. First, it

[74] Sodipo, *supra* note 73, at 197.

[75] Charfoss, *supra* note 4, at 267.

[76] Samuelson, *supra* note 64, at 531; Laurence R. Helfer, *Regime Shifting: The Trips Agreement And New Dynamics of International Intellectual Property Lawmaking*, 29 YALE JOURNAL OF INTERNATIONAL LAW 1, 20 (2004).

[77] Samuelson, s*upra* note 64, at 531.

[78] TRIPS, *supra* note 12, Art 2(1) and 9 (1); Samuelson, *supra* note 64, at 531; Charles R. McManis, *Taking TRIPS on the Information Superhighway: International Intellectual Property Protection and Emerging Computer Technology*, 41 VILLANOVA LAW REVIEW 207, 217 (1996).

[79] Samuelson, *supra* note 64, at 531.

[80] *Id*.

brings computer programs, whether in source or object code, within the international copyright system founded on the Berne Convention.[81] Second, it expressly defines computer programs as literary works. Last, but not least, TRIPS provides an effective system of enforcement, through the WTO DSM for compliance with the TRIPS obligations. It is worth noting that not only the violation complaints, but also non-violation complaints, can be brought before the WTO Dispute Settlement Body (DSB). Therefore, TRIPS extends minimum copyright standards, strengthened by WTO DSM, to computer programs.

Although the TRIPS Agreement made substantial advances with regards to computer software protection, some significant concerns remained, especially with regards to the scope of copyright protection issues. In the following subsections, we first examine the copyright protection under the TRIPS agreement and put forward the problems associated with it. Afterwards, the dispute settlement mechanism of the WTO will be briefly explained.

A. TRIPS Copyright Protection

The TRIPS Agreement solved, to a large extent, uncertainty relating to the status of computer software protection by conferring copyright protection on computer software. According to Article 10 of the TRIPS Agreement, "[c]omputer programs, whether in source or object code, shall be protected as literary works under the Berne Convention."[82] Therefore, all WTO member states must grant copyright protection to computer programs within the system based on the Berne Convention.[83] Under the national treatment principle of the Berne Convention, which was also adopted by TRIPS, copyright owners of computer programs should also benefit from the same protection mechanism as domestic copyright owners in other countries without any reciprocity.[84]

Furthermore, computer programs should also automatically enjoy the international minimum standards and enforcement mechanisms that the TRIPS

[81] Reichman, *supra* note 2, at 767.

[82] TRIPS, *supra* note 12, Art 10.

[83] It should be noted that although the TRIPS Agreement incorporates substantive provisions of the Berne Convention, it does not contain the Berne Conventions provisions relating to the moral rights--the rights of authors to have their authorship acknowledged and to prevent their work from being changed. This perhaps stems from the trade-related aspects function of the TRIPS Agreement.

[84] Berne Convention, *supra* note 59, Art 5 (1); TRIPS, *supra* note 12, Arts 1(3), 3, and 4.

Agreement established.[85] Apart from the clarification that computer programs are protected as literary works, TRIPS also requires member states to give authors of computer programs the right to authorize or prohibit commercial rental of their copyrighted works.[86] In addition, computer program copyright holders can also benefit from all the enforcement mechanisms that TRIPS sets out under Part III of the Agreement.[87] Enforcement procedures under Part III are grouped under five sections: general obligations, civil and administrative procedures and remedies, provisional measures, border measures, and criminal procedures.[88] Under these provisions, owners of computer programs rights can benefit from a wide range of enforcement rights such as the right to obtain preliminary injunctions and the right to exclude the importation of "pirated copyright goods."[89] The home state of the copyright owner may also resort to the dispute settlement process, discussed below, against infringing states.[90]

Although the TRIPS copyright protection mechanism makes substantial advances in protecting computer programs, it has been argued that the TRIPS Agreement falls short of determining the scope of copyright protection.[91] Provisions in the TRIPS Agreement regarding the subject of scope of copyright protection to be accorded to computer programs are overly general. Indeed, while Article 9 states that "[c]opyright protection shall extend to expressions and not the ideas, procedures, methods of operation or mathematical concepts as such," Article 10 provides a parallel statement that such protection shall not extend to data or material itself.[92] Therefore, implementation of the distinction between idea and expression is left to the individual member states, and neither TRIPS nor the Berne Convention contains any detailed rule beyond the prohibition of wholesale copying of source and object code, known as piracy.[93] The major question in connection with computer programs is whether and how far copyright protection should extend to the nonliteral or functional elements of

[85] Reichman, *supra* note 2, at 777.

[86] TRIPS, *supra* note 12, Art 11.

[87] *Id.*, Art 41 to 61.

[88] *Id.*

[89] For more information with regard to enforcement mechanisms of the TRIPS World Trade, *see* World Trade Organization, GUIDE TO URUGUAY ROUND AGREEMENTS 227 (1998).

[90] Reichman, *supra* note 2, at 778.

[91] *Id.*, at 779.

[92] TRIPS, *supra* note 12, Arts 9(2) and 10.

[93] Reichman, *supra* note 2, at 780.

the programs, such as program behavior and structure, or if these aspects of the programs should be protected by another form of IP rights, specifically patents.

Program behavior can be defined as all actions that a computer can perform by executing object code.[94] For example, copying, deleting, cutting, inserting functions are some of the behaviors of a word processing program.[95] On the other hand, program structure can be defined as the structure, sequence and organization of the program designated to operate in an efficient way.[96] It has been argued that even though these elements are the most valuable aspects of the programs, and often expensive to develop, they are vulnerable to rapid imitation.[97] Copyright protection for source and object code of the program cannot prevent second comers from imitating these functional aspects of the program. Competitors can imitate these functional elements of the program even if they can not access the source code of the program by using reverse engineering practices, with reverse engineering being defined as examining, including decompiling or disassembling practices, software to determine its underlying ideas and is legal in many countries.[98]

Reverse engineering practices are legal under the TRIPS Agreement.[99] It can be argued that by protecting only source and object codes as literary works, TRIPS specifically denies protection of the underlying ideas of computer programs. If copyright protection under the TRIPS Agreement were too strong, it would give the copyright owner a monopoly over some important technological functions.[100] Such protection would create a *de facto* patent protection which would impede other developers, especially open source developers as well as small- and medium-sized software enterprises, in improving their own programs.

Nevertheless, the TRIPS Agreement did not close the door completely to the granting of patent protection for computer programs. Because Article 27 of the TRIPS Agreement, which regulates the subject matter of the patent protection, does not explicitly exclude computer programs from patent

[94] Samuelson, *supra* note 43, at 2316.

[95] *Id.*

[96] Karjala, *supra* note 7, at 53.

[97] Samuelson, *supra* note 43, at 2310-12.

[98] Lorrie Ackerman, "Should Reverse Engineering of Computer Software Through Intermediate Copying Be Prohibited?", *at* http://lorrie.cranor.org/pubs/re (last visited May 12, 2007).

[99] Reichman, *supra* note 2, at 782.

[100] Charfoss, *supra* note 4, at 272.

protection, member states may adopt patent protection for the computer programs, provided that they do not discriminate against foreign developers.

B. WTO Dispute Settlement Mechanism

As one commentator argues "the most heralded accomplishment of TRIPS is its dispute settlement process."[101] According to Article 64(1) of the TRIPS Agreement, "…Articles XXII and XXIII of GATT 1994 as elaborated and applied by the Dispute Settlement Understanding, shall apply to consultations and the settlement of disputes under this Agreement…."[102] The WTO DSM not only establishes the causes of action which member countries may raise against the offending party/parties, but also establishes the procedures that they must follow.[103]

When a member state believes that any benefit under the TRIPS Agreement has been impeded by another state's policies or actions, it can file a complaint. If conciliation and mediation efforts fail to settle the problem within a fixed time period, the complaining country can ask the DSB, which consists of all WTO members, to establish a "panel" of experts to consider the case.[104] If the panel or the appellate body with authority to review the panel's rulings decides that the disputed measure breaches the agreement or an obligation, the concerned party must give notice of its intention to implement adopted recommendations.[105] In the event of non-implementation, the offending state may face trade sanctions, which may be imposed even against unrelated products.[106]

Although most complaints brought under the DSM have largely depended on paragraph (a) of the Article XXIII of the GATT, which refers to the specific violations WTO Agreements, paragraph (b) of the same article (GATT) also

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[101] Samuelson, *supra* note 64, at 531.

[102] TRIPS, *supra* note 12, Art. 64.

[103] According to the current WTO Rules, only Member governments can be "plaintiffs" or "defendants" in a WTO case. No private party can access to the dispute settlement system and no decisions within the system directly implicate private party's rights. Nevertheless private party's interests are frequently behind the decision of a government to notify a dispute, of course.

[104] Marrakesh Agreement Establishing the World Trade Organization, Annex 2: Understanding on Rules and Procedures Governing the Settlement of Disputes [hereinafter "DSU"], Art. 6, *available at* http://www.wto.org/english/docs_e/legal_e/28-dsu.pdf (last visited May 11, 2007).

[105] *Id*., Art 21(3).

[106] *Id*, Art. 22; Samuelson, *supra* note 64, at 531.

permits complaints for nullification or impairment of benefits granted by the agreement, even if the application of other party does not explicitly conflict with the provisions of the Agreement.[107] These cases generally constitute "non-violation cases."[108] This confers on computer software owners the ability to challenge, not only the validity of the offending party's legislation, but also the method in which that legislation is being implemented in that state.[109] Nevertheless, it should be noted that no non-violation complaint has been made in the WTO DSM so far, due to difficulties of provability in non-violation claims

III. PATENTABILTY OF COMPUTER SOFTWARE UNDER THE TRIPS AGREEMENT AND ITS APPLICATIONS

A. Patent Provisions of TRIPS Agreement

The Paris Convention, which has been the main multilateral agreement in the field of patents, by leaving it to each country to define which inventions must be patentable, what rights the owner of patent has, what exceptions to those rights are permissible, or how long the protection should last, failed to establish a sound international protection mechanism.[110] On all these important patent protection issues, the TRIPS Agreement makes substantial advancements over the Paris Convention. However, it did not answer indisputably the issue of whether a computer program can be patented or not.

On patentability, Article 27(1) of the TRIPS Agreement states that "[s]ubject to the provisions of paragraphs 2 and 3, patents shall be available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application…."[111] For the purpose of this article, the terms "inventive step and "capable of industrial application" are synonymous with the terms "non-obvious" and "useful," respectively.[112] The category of patentable subject

[107] General Agreement on Tariffs and Trade (GATT), Art XXIII (b) *available at* http://www.wto.org/english/docs_e/legal_e/gatt47_e.pdf, 12.05.2005; William J. Davey, *The WTO Dispute Settlement Mechanism*, Illinois Public Law and Legal Theory Research Papers Series Research Paper No. 03-08, 4, June 25, 2003, *available at* http://papers.ssrn.com/ sol3/papers. cfm?abstract_id=419943, 12.05.2005; Mcmanis, *supra* note 79, at 228, Charfoss, *supra* note 4, at 269.

[108] Davey, *supra* note 108, at 4.

[109] Charfoss, *supra* note 4, at 269.

[110] WTO, *supra* note 90, at 224.

[111] TRIPS, *supra* note 12, Art 27.

[112] *Id.*, n.5 of the Art 27.

matter is defined very broadly by using such phrases as "any inventions," "whether products or process," and "in all fields of technology." However, this broad definition is also subject to some limitations.

Although not explicitly mentioned in the TRIPS Agreement, the first limitation, which is generally accepted by the member states, is that natural principles, scientific phenomena, abstract ideas and mathematical formulas are not patentable.[113] These subjects have always existed before one discovers them, and granting monopoly over these subjects would impede new inventions and technological improvements. For this reason, they are commonly considered to be in the public domain.

In addition, the TRIPS Agreement provides two kinds of exceptions. The second paragraph of Article 27 of the TRIPS Agreement permits member states to exclude some type of inventions from patentability. In accordance with Article 27 (2), member states may exclude inventions, the prevention of whose commercial exploitation is necessary to protect public order or morality, including to protect human, animal or plant life or the environment, from patentability.[114] According to Article 27(3), member states may also exclude "diagnostic, therapeutic and surgical methods for the treatment of humans or animals" and "plants and animals other than microorganisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes" from patent protection.[115]

Nevertheless, Article 27 does not have any guidance with regard to the patentability of computer programs. Therefore, the exact nature of software patentability becomes a complicated question under the TRIPS Agreement. It is argued that although the TRIPS Agreement mentions computer programs in the context of the copyright protection, it does not mean that protection of computer programs by patents would be excluded under TRIPS Agreement.[116] On the contrary, opponents have argued that TRIPS does not entail any different

[113] United States Patent and Trademark Office, "Examination Guidelines for Computer-Related Inventions" (USTPO Guidelines) available at http://www.bitlaw.com/source/soft_pats/final.html, 10.05.2005; EPC, *supra* note 23, Art 52 (2); Decree Law No. 551, *supra* note 30, Art. 6.

[114] TRIPS, *supra* note 12, Art 27(2); WTO, *supra* note 90, at 224.

[115] TRIPS, *supra* note 12, Art 27(3).

[116] IBM claims in Decision of the EPO Technical Board of Appeal at the case Number T 1173/97 *available at* http://legal.european-patent-office.org/dg3/pdf/t971173ep1.pdf (last visited May 12, 2007).

agreement on patentability and that Article 27 would not lead to any extension of patentability.[117]

Despite the fact that TRIPS contains vague provisions concerning the patentability of computer programs, many countries permit the patenting of software-related inventions[118] at least to some degree.[119] This attitude is reasonable because many mechanical or electrical inventions include software implementations to some extent. Denying patent protection to these inventions would violate Article 27, which excludes only a few specific fields from eligibility.[120]

On the other hand, uncertainty with regards to the boundaries of the protection has caused dissimilar applications among the member countries. For example, U.S. courts, and subsequently the new USPTO Guidelines,[121] have relaxed the subject matter of software-related inventions, and now even a computer program can be patented on its own.[122] On the other hand, software-related inventions are patentable in the EU if they produce a "technical effect" which goes beyond the normal physical interaction between the software and the computer.[123]

Although the applications among countries may differ to the extent that member states allow the patenting of software-related inventions, WTO members should also take into account other patentability requirements and make the minimum rights available to the right holders as set by the TRIPS Agreement. In this context, in order to be a patentable subject matter, an invention must satisfy the novelty, inventive step, and industrial application

[117] Foundation for a Free Information Infrastructure (FFII), The TRIPS Treaty and Software Patents, *available at* http://swpat.ffii.org/analysis/trips/swpattrips.en.pdf (last visited May 12, 2007).

[118] The terms "computer-implemented invention," "software-enabled invention," "software-operated invention," and "computer program-related inventions" are also used to convey the same meaning.

[119] Fenwick, *supra* note 6, at 4-5.

[120] Reichman, *supra* note 2, at 769.

[121] USTPO Guidelines, *supra* note 113.

[122] Gregg Jansen, *The United States Moves Ahead of the European Union in Patent Protection for Computer Software*, 6 INDIANA INTERNATIONAL & COMPARATIVE LAW REVIEW 741, at 767-768 (1996).

[123] EU Parliament, *supra* note 5, at 11

requirements.[124] Regrettably, there are no clear definitions of these terms under the TRIPS Agreements, and the application of these requirements differs significantly among the member states, especially between the developed and developing countries.

In the same frame, member states must also provide basic rights conferred by the TRIPS Agreement.[125] For example, when a software-related invention is a product, the owner of the patent has exclusive rights to prevent others from making, using, offering for sale, selling, or importing that product for these purposes.[126] On the other hand, when it is a process, the owner has a right to prevent third parties from using the process, and from using, offering for sale, selling, or importing for these purposes at least the product obtained directly by that process.[127] Patent owner shall also have the right to assign, or transfer by succession, the patent and to conclude licensing contracts.[128]

Moreover, member states may provide some limited exceptions to the exclusive rights conferred by patents. Nonetheless, such exceptions should not unreasonably conflict with the normal exploitation of the patent and should not prejudice the legitimate interests of the patent owner.[129] Similarly, while Article 31 allows compulsory licensing practices and government use without the authorization of the right holder, these are subject to a list of conditions aimed at protecting the legitimate interests of the right holder.[130] These include an obligation not to grant such licenses before making efforts to acquire authorization from the rights holders on reasonable terms and a requirement to pay adequate remuneration to the right holder.[131] In addition, the legal validity of these decisions and the amount of remuneration is subject to judicial or other independent review by a distinct higher authority in that member states.[132]

As for the duration of the protection, the TRIPS Agreement provides that the term of protection available shall not end before the expiration of a period of

[124] TRIPS, *supra* note 12, Art 27; WTO, *supra* note 90, at 224.

[125] Guide to Uruguay Round Agreements, *supra* note 90, at 225; Reichman, *supra* note 2, at 772.

[126] TRIPS, *supra* note 12, Art 28 (1) (a).

[127] *Id.*, Art 28 (1) (b).

[128] *Id.*, Art 28 (2).

[129] *Id*., Art 30.

[130] *Id*., Art 31.

[131] *Id*., Art 31; WTO, *supra* note 90, at 225.

[132] *Id.*

20 years from the filing date.[133] The Agreement also clearly establishes that during this period, member states provide the same patent protection to the nationals of other member states without discrimination.[134] Moreover, because of the national treatment principle, patent protection for foreign inventions cannot be linked to reciprocation.[135]

B. Software Patent Debate

The question of whether or not software can be patented is not explicitly solved by the TRIPS Agreement; instead, it is left to the discretion of the individual member states. Therefore, until the member countries reach a common understanding, each country is free to accept or deny a software patent by evaluating the pros and cons. Several reasons are asserted both against and in favor of the software patents. The most widespread arguments are:

1. Arguments against Software Patents

a) Computer software is actually an algorithm or a mathematical formula. An algorithm is a series of steps to solve a problem and computer program is an implementation of that algorithm, which is like an implementation of mathematical equation $E=mc^2$.[136] Granting patents for mathematical algorithms would preclude others from performing the same process. So like mathematical algorithms, computer programs should not be patented.

b) The main aim of the patent protection is to give economic incentives to inventors in order to stimulate innovative activities. Unlike sectors such as the pharmaceutical industry, software development and innovation is commercially attractive for developers without patent protection.[137] The enormous developments that the software industry has achieved during the last three decades are clear evidence of this. One may argue that even if patent protection is not necessary to stimulate innovative activities in the software industry, the information function of the patent system is still valuable because other inventors may use this disclosed information. This argument may be justified by claiming that many commercial software developers keep inventions involving programming techniques secret in object code -- the form in which software is shipped to users. However, research shows that patent archives are primarily

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[133] TRIPS, *supra* note 12, Art 33.

[134] *Id.*, Art. 3, 4, and 27(1).

[135] Reichman, *supra* note 2, at 772.

[136] Jansen, *supra* note 123, at 4.

[137] EU Parliament, *supra* note 5, at 21.

valued for legal purposes, and to a lesser extent, as a source of technical information.[138] It should also be noted that patents may impede the new creation of innovations because of the burden, or even the impossibility, of obtaining licenses from the first inventor.

c) Exclusive rights granted by patents diminish competition by creating monopolies in the market.[139] To a certain extent, this is an inevitable and permitted consequence of the patent system. However, the fact that the software industry has a natural tendency towards monopolies as a consequence of the need for standardization, allows software patents to have a further effect on monopolization in the sector.[140] In this respect, patent holders may use the protection mechanism against second inventors in an aggressive manner just to keep them out of the industry. For example, patent holders may file unjustified infringement lawsuits or they can simply use the threat of such lawsuits to discourage competitors. Even if second inventors win these lawsuits, dealing with that type of situation imposes a heavy burden of time and cost upon them.

d) Software patents have serious negative effects on the SMEs and open source developers.[141] Unlike the pharmaceutical industry, for example, investment needed in the software industry is fairly modest.[142] Because of this fact, SMEs, open source developers, and even individual developers can develop innovative products. Perhaps one of the most innovative and attractive examples of this kind of product is Linux, a computer operating system initiated by a Finnish student and developed by an unorganized virtual community on the Internet.[143] Linux source code, accessible over the Internet, allows programmers to enhance, extend and modify it. In the end, this unorganized community on the Internet created a challenging alternative for commercial operating systems. Consequently, aggressive use of the patent system, such as requesting unaffordable licensee fees, and the filing of unjustified lawsuits by big players, would impede these kinds of innovative activities. Neither SMEs nor open source developers have enough time or financial and human sources to deal with such obstacles.[144]

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[138] *Id*.

[139] *Id.*, at 22.

[140] EU Parliament, *supra* note 5, at 22.

[141] *Id.*, at 25-26.

[142] *Id*., at 25.

[143] I*d.*, at 26.

[144] *Id.*, at 23.

d) One of the particular problems arising from software patents is the trend toward granting patents to business methods. After the Federal Circuit's decision in 1998 in *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*,[145] patents can now be granted for business processes in the U.S. The expansion of software patents to business methods, however, is unsupportable under the TRIPS Agreement and has many drawbacks.[146] First, the methodological concepts for doing business or the technological implementation of business processes are too abstract to be patented. Second, business method patenting can distort competition at a very basic level. By giving exclusive rights to a company to exploit a patented method or idea, the other companies, especially SMEs, which have insufficient resources to obtain patent licenses, could be adversely affected.

f) One other problem that software patents create is "trivial patents." The main difference between patents and copyrights is that patents require a certain threshold of inventive steps. This means that in addition to the novelty requirement, patentable inventions require a substantial level of the non-obviousness standard. Nonetheless, in practice, numerous patents have been granted to trivial inventions -- inventions which are not non-obvious. This is may be so partly because of patent offices' inefficiency and partly because of insufficient, unclear and inappropriate rules. As a result, trivial patents not only decrease general patent quality but also impede improvements in the sector when they are used against second inventors, especially SMEs and open source developers.

g) Patent offices generally lack qualified patent examiners to review software applications and have insufficient funds to hire additional staff or to train existing staff. Thus, trivial patents are often issued, which impedes future innovations. Ineffective patent offices are not only the problem of developing countries but even the most developed countries as well.

2. Arguments in favor of Software Patents

a) Although software exists as written text, both as source and object codes, unlike other copyrightable subject matters, its primary purpose is not that they be read by human beings.[147] Rather, software, at least in object code form, is written for the purpose of performing functional tasks.[148] Computer software,

[145] Street Bank & Trust Co. v. Signature Financial Group, Inc, 149 F. 3d 1368 (1998).

[146] Vincent Chiappetta, *Trip-Ping Over Business Method Patents*, 37 VANDERBILT JOURNAL OF TRANSNATIONAL LAW 181, 181 (2004).

[147] Karjala, *supra* note 7, at 42.

[148] *Id.*, at 47.

in conjunction with the computer, carries out the particular task or set of tasks itself.[149] In short, software is a functional work of technology.[150] Historically, patent protection has always been available for functional subject matters.[151]

b) Since software invention requires considerable investment of time and money, it should be protected. Given the limited ability of copyright to protect the valuable functional aspects of software such as behavior and structure, sequence, or organization, second comers could simply copy these aspects either directly from the source code or by decompiling the object code.[152] These kinds of practices diminish the real value software and deprive the original developers of the ability to recoup their development costs and from earning money from their inventions. Therefore, the prospect of obtaining an exclusive right to practice and/or license an invention under patent protection gives inventors important financial incentives to invest time and resources in developing new inventions.[153]

c) In evaluating software patents, the informational and educational function of the patents should also be taken into consideration. In the patent area, the inventor discloses the invention's details to the public in return for the right to exclude others from making, using, or selling an invention for a limited time period, instead of keeping them secret.[154] This information expands the body of scientific and technological knowledge that future inventors may use. Although competitors are not able to use a patented invention for a limited time period, they often benefit from the disclosed information and find new ways to improve their products.[155]

d) Effective protection of the software industry is an economic necessity. Over the few past decades, the software industry has achieved a substantial growth rate which continues to grow unabated. The advances of the Internet and information technologies leave no doubt that in the future, computers and computer software will have penetrated almost every aspect of modern life.

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[149] *Id*., at 42 and 63.

[150] *Id*., at 42.

[151] *Id*., at 47.

[152] Bradford L. Smith and Susan O. Mann, *Innovation and Intellectual Property Protection in the Software Industry: An Emerging Role for Patents?*, 71 UNIVERSITY OF CHICAGO LAW REVIEW 241 (2004).

[153] *Id*., at 263.

[154] *Id.*

[155] *Id.*

Countries that want to increase or at least to sustain investments in this sector should provide effective protection mechanisms for these technologies.

e) Availability of patent protection for software not only benefits large firms but also provides many advantages to SMEs and individual developers as well. First, patents may help SMEs and individual developers to capitalize their inventions into assets which can be sold or licensed.[156] Second, patents can also help start-up SMEs to attract venture capital to their attractive software innovations.[157] Third, patents are listed as assets on companies' balance sheets and in that way help SMEs obtain financing more easily.[158] Furthermore, even if SMEs do not apply for patents, they would benefit from the disclosed information of patents granted to others.[159]

f) In compliance with international commitments, patent laws typically grant inventors twenty years of protection from the time the patent application.[160] This period of exclusivity is shorter than copyright protection, which is generally accepted as author's life plus fifty years.[161] Therefore, patented inventions are likely to go into the public domain more quickly than works protected by copyright.[162]

C. Application in the U.S.

Based on the U.S. Constitution, the Patent Act, which is codified under Title 35 of the United States Code, regulates the requirements for obtaining a patent.[163] Section 101 of the Title requires that "[w]hoever invents or discovers any new and useful process, machine, manufacture of composition of matter…may obtain a patent therefore, subject to the conditions and requirements of this title."[164] This section sets out the three general requirements, namely novelty, usefulness and non-obviousness, for obtaining a patent. The novelty requirement, which is defined in Section 102, requires that

[156] Smith and Mann, *supra* note 152, at 262.

[157] *Id.*

[158] EU Parliament, *supra* note 5, at 25.

[159] *Id.*

[160] TRIPS, *supra* note 12, Art 33.

[161] Smith and Mann, *supra* note 152, at 257.

[162] *Id.*

[163] 35 U.S.C. §§ 1-376.

[164] 35 U.S.C. § 101.

an invention cannot be patented if certain public disclosures of the invention have been made.[165] While the term "usefulness" refers to the condition that the subject matter has a useful purpose, Section 103 clarifies the non-obviousness requirement that the invention should not be obvious to a person having an ordinary skill in the art.[166]

Apart from these general conditions, there are no further statutory requirements for patentability. On the other hand, U.S. courts have created two exceptions: the mathematical algorithm and business method exceptions for the software patents on the grounds that they constitute abstract ideas or laws of nature.[167] However, during the past three decades the scope of these two exceptions has been constricted to a large extent by the courts.

The first court case in the computer software area was *Gottschalk v. Benson*,[168] decided by the U.S. Supreme Court. In this case, the patent claim was a method for converting binary-coded decimal numerals into pure binary numerals for use by a computer.[169] The Court found that the computer program in this case implemented a mathematical algorithm defined as "[a] procedure for solving a given type of mathematical problem…" and rejected the patent claim on the grounds that granting a patent for algorithms would monopolize the law of nature.[170]

In a subsequent software case, *Parker v. Flook*,[171] the Supreme Court once again rejected a patent application submitted for a computerized method of updating alarm limits in a chemical conversion process.[172] The Court held that the only novel feature of the invention was a mathematical formula implemented in the computer program.[173] It further noted that the presence of post-solution activity -- the adjustment of the alarm limit to the number

[165] 35 U.S.C. § 102.

[166] 35 U.S.C. § 103.

[167] John Fellas, *The Patentability of Software-Related Inventions in the United States*, E.I.P.R 1999, 21(6), 330, 331.

[168] Gottschalk v. Benson, 409 U.S. 63 (1972).

[169] *Id.*, at 65.

[170] *Id.*, at 72.

[171] Parker v. Flook, 437 U.S. 584 (1978).

[172] Julie E. Cohen and Mark A. Lemley, *Patent Scope and Innovation in the Software Industry*, 89 CALIFORNIA LAW REVIEW 1, 9 (2001).

[173] *Parker*, 437 U.S. at 588.

calculated by the computer -- was insufficient to transform the unpatentable process to patentable.[174]

Three years later, however, the Court changed its view in *Diamond v. Diehr*.[175] The Court held that the improved process for closely monitoring mold temperatures, using a computer and the well-known Arrhenius equation[176] for determining the appropriate time to open the molds, was a patentable process. Although the Court explained that three categories of subject matter are excluded from patent protection: "laws of nature, natural phenomena, and abstract ideas," it noted that the mere use of a mathematical algorithm or computer program cannot prevent an invention from being patented, provided that the invention as whole bear all patentability conditions.[177] The decisive test used in *Diamond* was whether the invention as a whole transforms or reduces an article to a different state or thing.[178] The criterion was met by the invention at hand, since it transformed the mathematical equation into a computer-controlled process to cure synthetic rubber.[179]

Following *Diamond*, in a sequence of cases,[180] the so-called two-step *Freeman-Walter-Abele* test, was developed. The first addresses whether a mathematical algorithm is recited directly or indirectly in a claim, and the second is that if it does, whether the claimed invention as a whole is no more than the algorithm itself; for example, the algorithm is not applied to physical elements or process steps. If the results of both steps are affirmative, then the invention is not patentable subject matter.

This test later came under fire by the courts.[181] *In re Alappat*[182] the Court of Appeals for the Federal Circuit ruled that the inquiry required by the *Freeman-*

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[174] *Id*., at 590; Jansen, *supra* note 123, at 752.

[175] *Diamond*, 450 U.S. at 175.

[176] Named after its discoverer Svante Arrhenius, the equation can be expressed as follows Inv =CZ + x; *Diamond*, 450 U.S. at 178 n.2.

[177] *Id.*, at 192.

[178] *Id.*

[179] EU Parliament, *supra* note 5, at 12.

[180] *See* In re Freeman , 573 F.2d 1237 (1978); In re Walter, 618 F.2d 758 (1980); In re Abele, 684 F.2d 902 (1982).

[181] Fellas, *supra* note 168, at 331.

[182] 33 F.3d 1526 (1994).

Walter-Abele is not needed.[183] The invention in *Alappat* involved a software program for the transformation of numerical values in a manner that created a smooth waveform display in a digital oscilloscope.[184] The Court explained that the proper inquiry is whether the claimed subject matter is a disembodied mathematical concept which may categorized as a mathematical formula, a mathematical equation, or a mathematical algorithm. If so, the claimed subject matter is not patentable.[185] The Court noted that the invention at hand, however, was not a disembodied mathematical concept, but rather a specific machine to produce a useful, concrete, and tangible result.[186] According to the Court, computer software creates a new machine when it programs the computer because a general purpose computer in effect becomes a special purpose computer to perform particular functions pursuant to instructions from program software.[187] Consequently, a computer operating pursuant to software may represent patentable subject matter, provided that the claimed subject matter meets all of the other requirements of patentability.

In 1998, the Court of Appeals for the Federal Circuit decided a landmark case, *State Street Bank and Trust Co. v. Signature Financial Group Inc*,[188] in computer software patents. The invention at issue is a software-implemented financial system which automatically calculates and allocates profits from a joint stock account. The District Court rejected both the mathematical algorithm and business method exceptions claims.[189] With regard to the former exception, the Court again stressed that the Freeman-Walter-Abele test "has little, if any, applicability to determining the presence of statutory subject matter."[190] It stated, rather, that the decisive test is whether an invention produced a ""useful, concrete and tangible result"[191] Concerning the business method exception, the Court determined that this exception has never existed; prior business method inventions had always been denied on other grounds.[192] Therefore, if a business

[183] Cohen and Lemney, *supra* note 173, at 10; Fellas, *supra* note 168, at 331.

[184] *In re Alappat,* 33 F.3d at 1537.

[185] *Id*., at 1544.

[186] *Id.*

[187] *Id*., at 1545.

[188] Street Bank and Trust Co., 149 F. 3d 1368 (1998).

[189] Street Bank and Trust Co. v. Signature Financial Group Inc, 927 F. Supp. 502, 516-17, (D. Mass. 1996).

[190] *Street Bank and Trust Co.,* 149 F. 3d, at 1374.

[191] *Id*.; Cohen and Lemney, *supra* note 173, at 10.

[192] *Street Bank and Trust Co.,* 149 F. 3d, at 1375; Fellas, *supra* note 168, at 333.

method produces "useful, concrete and tangible results" and bears the other statutory requirements, it can be patented in the U.S.

The Federal Circuit Court affirmed the *State Street Bank* reasoning in *AT&T v. Excel Communications.*[193] The patent claim in this case was a software implemented method for "the generation of a 'message record' for long-distance telephone calls" and recording to whom the calls should be billed.[194] The court applied the "useful, concrete and tangible result" test and concluded that the invention comfortably fell within the scope of patentable subject matter.[195]

D. Application in the E.U.

There are two statutory sources that govern patents in Europe. The first one is the European Patent Convention (EPC), a treaty among 32 European countries.[196] The second is the national patent laws of the contracting parties. Although the national patent laws and European Patent Convention are similar in structure, application by the contracting parties may sometimes differ. This article will examine the patentability of computer software under the EPC, which creates a common system of law for the Contracting States rather than examining national systems.

According to Article 52(1) of the EPC, "European patents shall be granted for any inventions which are susceptible to industrial application, which are new and which involve an inventive step." Paragraph 2 of Article 52 of the EPC lists some subject matters, such as discoveries, scientific theories and mathematical methods that cannot be patented. Computer programs are also explicitly mentioned on the excluded items list.[197] However, paragraph 3 of the same article states that all items listed in paragraph 2 are excluded only from patentability "as such."[198] The term "as such" means that like other parts of the

[193] AT&T v. Excel Communications, 172 F.3d 1352 (1999).

[194] *Id.*, at 1354.

[195] *Id*., at 1361.

[196] All 27 EU Members: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Germany, Greece, Denmark, Estonia, Spain, Finland, France, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovenia, Slovakia and Sweden and United Kingdom. The other contracting parties to the EPC are Liechtenstein, Monaco, Switzerland, Iceland, and Turkey.

[197] EPC, *supra* note 24, Art 52(2) (c).

[198] *Id*., Art 52 (3).

paragraph 2, computer software is open to patent protection provided that it meets the other requirements.

From the first paragraph of Article 51, it is understood that a statutory invention must meet three requirements: novelty, industrial application and an inventive step to qualify for patent.[199] Novelty is defined in Article 54 as not forming a part of the state of the art.[200] The requirement of the inventive step is clarified in Article 56, which states that an invention should not be obvious to a person skilled in the art.[201] The industrial application requirement is explained in Article 57 which requires that an invention must be made or used in any kind of industry, including agriculture.[202]

In addition to these three general statutory requirements, it is generally accepted that an invention must also be technical in order to qualify for a patent.[203] Although this requirement is not mentioned explicitly in the EPC, it is derived from EPC Rule 27(1)(a),[204] which requires that description of the invention "shall specify the technical field to which the invention relates."[205] The technical requirement has caused considerable debate in practice because of the fact that there is no agreed legal definition of the word of "technical" in the context of computer software.[206] In fact, this requirement has played a crucial role in the decisions of the Technical Boards of Appeal of the EPO in this regard.

The landmark European case on computer software patents is the Vicom case (T 0208/84).[207] The patent applicant, Vicom Systems Inc., claimed an invention for a method and apparatus for improved digital image processing. The issue before the EPO Technical Board of Appeal was whether the invention should be excluded from patentability under EPC 52(2) and (3) because it

[199] *Id.*, Art 52(1).

[200] *Id.*, Art 54.

[201] *Id*., Art 56.

[202] *Id*., Art 57.

[203] EU Parliament, *supra* note 5, at 8.

[204] EPC, *supra* note 24, Art 164 (1)(stating that the rules are to be seen as part of the Convention).

[205] EU Parliament, *supra* note 5, at 8.

[206] *Id.*

[207] T 0208/84, *available at* http://legal.european-patent-office.org/dg3/biblio/t840208ep1.htm (last visited May 12, 2007).

related to a computer program as such.[208] The Board held that even though the underlying idea of the invention is a mathematical method, the claim focused on a technical process and did not seek protection for the mathematical method as such.

In the subsequent case of *Koch & Sterzel* (T 0026/86),[209] the Board issued a similar decision. The patent application in this case was a computer controlled X-ray apparatus. The Board ruled that even though a computer program as such is non-statutory, an invention consisting of a mix of technical and non-technical elements must be assessed as a whole, and if it uses technical means, its patentability is not ruled out.[210]

In the *Sohei* Case (T 0769/92),[211] the Board gave an affirmative decision on the patentability of an invention which arguably fell within the business method exception. The invention at issue concerned an inventory management system, implemented on a computer. The Court held that a statutory technical invention would not become non-statutory because of the fact that it includes non-technical elements. The Board decided that the technical features of the claim were sufficient because there were significant technical difficulties in computerizing the financial management methods referred to in the application.

However, several years later in its decision in the *Pension Benefits System* case (T 0931/95),[212] the Board held that a method for controlling a pension benefits program (the method allowed the production of reports on the periodic benefits payments due to the employees enrolled in the scheme) could not be patented.[213] The Board noted that all the features claimed were merely administrative or had an actuarial function and did not involve a technical character. Thus, while a technical invention does not lose its patentable status because of a non-technical feature, a non-technical invention does not gain such status by including a technical feature.

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[208] Jansen, *supra* note 123, at 760.

[209] T 0026/86, *available at* http://legal.european-patent-office.org/dg3/biblio/t860026ep1.htm, (last visited May 12, 2007).

[210] Jansen, *supra* note 123, at 763.

[211] T 0769/92, *available at* http://legal.european-patent-office.org/dg3/biblio/t920769ep1.htm (last visited May 12, 2007).

[212] T 0931/95, *available at* http://legal.european-patent-office.org/dg3/pdf/t950931eu1.pdf (last visited May 12, 2007).

[213] *Id.*

In its two recent decisions (Case T 1173/97 and Case T 0935/97),[214] both involving IBM patent applications, the Board interprets the technicality requirement in a way that a program itself could be patented so long as there is a "further technical effect."[215] The Board expressed that "…a computer program claimed by itself is not excluded from patentability if the program, when running on a computer or loaded into a computer brings about, or is capable of bringing about, a technical effect which goes beyond the normal physical interactions between the program (software) and the computer (hardware) on which it is run."[216] The Board explained that every computer program produces a "technical effect" when run on a computer in the form of electrical currents, but these kinds of effects are insufficient. In order to be patentable, some other further technical effect is required.[217] In explaining further technical effect the Board stated that

…a patent may be granted not only in the case of an invention where a piece of software manages, by means of a computer, an industrial process or the working of a piece of machinery, but in every case where a program for a computer is the only means, or one of the necessary means, of obtaining a technical effect within the meaning specified above, where, for instance, a technical effect of that kind is achieved by the internal function of a computer itself under the influence of said program.[218]

In sum, software-related inventions can be patentable in Europe, provided that the claimed invention produces a technical effect beyond the electrical currents in the computer circuitry.[219] Although neither the EPC nor the decisions of the Board of Appeals of the EPO have established a crystal-clear definition of this requirement, some fairly good generalizations may be derived from the EPO Decisions.[220] One of them is that if computer software acts on physical data, *e.g.*, an image or the control data for an X-ray machine, it can be patented.[221] The further technical effect can also be achieved when such a

[214] T 1173/97, *available at* http://legal.european-patent-office.org/dg3/pdf/t971173ep1.pdf (last visited May 12, 2007).

[215] EU Parliament, *supra* note 5, at 10.

[216] T 1173/9, *supra* note 213, at 30.

[217] EU Parliament, *supra* note 5, at 10.

[218] T 1173/97, *supra* note 215, at 16.

[219] EU Parliament, *supra* note 5, at 10.

[220] Dai Rees, *Software Patents-EPO Practice: History Practice and State of Play*, 8, *available at* http://www.ps.uni-sb.de/~tmueller/reestran.pdf (last visited May 9, 2007).

[221] *Id.*

program controls the internal functions of the computer, such as saving memory, or increasing speed.[222] Finally, if the implementation of computer software solves a technical problem, it can be patented. According to the Boards of Appeal decisions, for example, money, business data and text do not themselves give the necessary further technical effect.[223]

It should be noted, however, that the approach of the EPO is not being followed in all contracting states and that even if a patent is granted by the EPO, a patent application for the same kind of invention may be rejected at the national level because of the different approaches as to what is "technical character." In order to overcome this problem and harmonize the applications of EU member states, the European Commission prepared a "Proposal for a Directive of the European Parliament and of the Council on the Patentability of Computer-implemented Inventions" in 2002.[224]

However, this proposal became controversial not only between the member states but also between the EU Council and Parliament. The Parliament is of the opinion that the scope of software patentability should be limited. In fact, in September 2003, it passed the directive, which includes 64 amendments tightening the wording and reducing the scope of computer-related patentability.[225] On the other hand, on 18 May 2004, the Council took the position, in line with the Commission initial proposal, that a computer-implemented invention should be patented provided that it has a "technical character." Nevertheless, on 6 July 2005 the Parliament rejected the proposal by an overwhelming majority and the legislative process ended.

The rejected Directive did not envisage any major changes in the existing statutory requirements for software-related inventions to be patentable.[226] In particular, it emphasized the "technical contribution" requirement for the patentability of software-related inventions.[227] According to that Directive,

[222] *Id.*

[223] *Id.*

[224] Proposed Directive On the Patentability of Computer-implemented Inventions, *supra* note 27.

[225] Proposal for a Directive of the European Parliament and of the Council on the patentability of Computer-implemented Inventions – Outcome of the European Parliament's first reading (Strasbourg, 22 to 25 September 2003) *available at* http://register.consilium.eu.int/pdf/en/03/st11/st11503.en03.pdf (last visited May 12, 2007).

[226] EU Parliament, *supra* note 5, at 31; Proposed Directive On the Patentability of Computer-implemented Inventions, *supra* note 27, Art 4(1).

[227] Proposed Directive On the Patentability of Computer-implemented Inventions, *supra* note 27, Art 4(2).

patent offices should assess the technical contribution requirement by the considering the difference between the scope of the patent application as a whole, elements of which may compromise both technical and non-technical features, and the state of art.[228]

However, since the mentioned Directive did not have the opportunity to become binding legislation, members of the EU are free to maintain their applications. On the other hand, since the EPC is not part of the community law, its provisions will remain unchanged. In practice, this means that like the other contracting parties, the EU members will be bound by the EPC with regard European patents applications. Nonetheless, it is highly probable that the software patent debate will become more intensive as the new software-related inventions emerge.

IV. PATENTABITY OF COMPUTER SOFTWARE IN TURKEY AND THE FUTURE

Computer programs in Turkey are mainly protected as copyrightable subject matter by Law No. 5846 on Intellectual and Artistic Works (Copyright Act), as amended by Law No. 4110. Article 2 of Intellectual and Artistic Works Law defines computer programs, expressed in any format, and its preparatory works, provided that they become programs in the next phase, as "scientific and literary works."[229] In line with international agreements such as the Berne Convention and the TRIPS Agreement, the scope of the copyright protection, rights of the copyright owners, and available remedies in case of violations are comprehensively articulated by the Law No 5846. A detailed analysis of the said provisions is out of the scope of this article.

Nevertheless, two important features of the Law No. 5846 need to be emphasized with regard to the computer programs. First, in line with the EU Directive 91/250/EEC, Law No. 5846 covers only the expression of the programs, both in the form of source and object codes, not the underlying ideas and principles of the program.[230] Second, similar to EU Directive 91/250/EEC, the Law also permits reverse engineering practices for the purposes of studying the ideas and principles underlying a program and the reproduction or

[228] *Id.*, Art 4(3).

[229] Intellectual and Artistic Works Law No. 5846 (Copyright Law of Turkey), Art 2, promulgated in the Official Gazete Nr. 7981, dated Dec. 13, 1951, *available at* http://www.kultur.gov.tr/teftis/BelgeGoster.aspx?F6E10F8892433CFF03077CA1048A183484F186FD0FCCD518 (last visited Dec. 16, 2007).

[230] Mustafa Topaloğlu, Bilgisayar Parogramları Uzerindeki Haklar ve Korunması (Legal Rights for Computer Programs and Protection of These Rights)(1995)(unpublished Ph.D. thesis, Selçuk University), at 109.

translation of code if necessary for the achievement of the interoperability of an independently-created computer program.

Computer programs, under certain circumstances can also be protected by patents in Turkey. Standing principles relating to patents are governed by "Decree Law No.551 Pertaining to the Protection of Patent Rights,"[231] which specifies the patentability requirements and meaning of these requirements similarly to the EPC, put into effect by Turkey in November 2000.[232] According to Article 5 of the Decree Law "[in]ventions which are novel, which surpass the state-of-the-art, and which are applicable in industry shall be protected by patents."[233]

Novelty requirement is defined in Article 7 as not forming a part of the state of art.[234] The requirement of surpassing the state of the art is clarified in Article 9, which states that an invention shall be deemed to surpass the state-of-the-art, when it is the result of an activity which is not obviously reachable from the state-of-the-art, by a person skilled in the concerned art.[235] The industrial application requirement is explained in Article 10, which requires that an invention must be made or used in any kind of industry, including agriculture.[236] Additionally, patents should also meet the technicality requirement. The Decree Law articulates this requirement similarly to the EPC. According to Article 46 of the Decree Law, a description of the invention should be written explicitly and compressively by a person skilled in the technical field, to which the invention relates, to enable the implementation of the invention.[237]

Nevertheless, not all subject matters can be patented under the Decree Law. Indeed, the first paragraph of Article 6 excludes some subject matters from the scope of the Decree Law due to not being inventions, such as discoveries, scientific theories, mathematical methods or computer programs.[238] On the other hand, paragraph 3 of the Article 6 states that patents shall not be

[231] Decree Law No 551, *supra* note 30.

[232] Regulation for Implementing the Convention on the Grant of European Patents in Turkey, promulgated in Official Gazette Nr. 24282, dated Jan. 9, 2001.

[233] Decree Law No 551, *supra* note 30, Art 5.

[234] *Id.*, Art 7.

[235] *Id.*, Art 9.

[236] Decree Law No 551, *supra* note 30, Art 10.

[237] Decree Law No 551, s*upra* note 30, Art 46.

[238] *Id.*, Art 6.

granted exclusively to the items mentioned in the first paragraph of this Article.[239] This statement has a similar meaning with the "as such" flexibly in the EPC, under which these items might be indirectly patented.[240]

Therefore, computer programs which solve a technical problem can be patented in Turkey provided that they are related to a machine or process and that the invention meets the patentability criteria-susceptibility to industrial application of being new, and not being obvious as a whole.[241] This kind of approach is rational in two ways. First, denying patent protection to inventions merely because of the fact that they involve software applications not only hampers inventive activities but also violates Article 27 of the TRIPS Agreement, which only excludes some specific fields form eligibility. Second, since Turkey is one of the contracting parties to the EPC, patents granted under the EPC becomes valid in Turkey on condition that the applicant demands protection in Turkey and complies with other procedural provisions of the Convention, such as paying the necessary fees and providing the Turkish translation of the application.[242] Thus, denying patent protection to the applications made under the national patent law would cause discriminative treatment against them.

The existing legal environment with regards to the protection of computer programs in Turkey is likely to be affected by developments in the U.S. and the EU. The current trend toward patentability of computer programs in the U.S. has caused a heated debate in other countries, especially in the EU. At present, Turkey is not a member of the EU, but commenced the accession negotiations in 2005. During the accession process, Turkey must harmonize its laws with those of EU. Thus, the current software patent debate in the EU and future amendments in connection with this area will directly affects Turkey's legal environment. Therefore, Turkey, which has a small market in software sector compared to that of EU, should take into account the following four factors in determining its position during the negotiation talks, and after accession to the EU.

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[239] *Id.*

[240] *See* M. Kaan Dericioğlu, B*ilgisayar Yazılımları Ve İş Görme Yöntemleri İle İlgili Buluşların Korunması (Protection of Computer Programs and Business Method Inventions*)**,** *available at* http://www.tubitak.gov.tr/anasayfadan/toplanti/kaan-sunum.html (last visited May 10, 2007).

[241] Topaloğlu, *supra* note 231, at 124.

[242] Selda Arkan, Fikir ve Sanat Eserleri Kanunu ve Patent Kanunu Çerçevesinde Bilgisayar Yazılımlarının Korunması (Protection of Computer Programs under Intellectual and Artistic Works Law and Patent Law)(2000) *available at* http://www.kobinet.org.tr/hizmetler/bilgibankasi/ mevzuat/ 012.html **(**last visited May 7, 2007); EPC, *supra* note 24, Art. 65, 70 and 78.

- The software industry has played an increasingly crucial role in every segment of the economy. The advances of the Internet and information technologies leave no doubt that in the future this trend will continue. Therefore, countries that want to increase or at least sustain investments in this sector should provide clear and internationally accepted legal protection mechanisms for these creations. The current international consensus, which was the TRIPS Agreement standard, concerning software protection is copyright protection. Existing copyright protection for the computer programs provided by the Intellectual and Artistic Works Law of Turkey is consistent not only with the EU Directive 91/250/EEC but also with TRIPS Standards.

- Reverse engineering, which is defined as examining software to determine its underlying ideas, including decompiling or disassembling practices, is an important tool for open source developers and for small- and medium-sized software enterprises, to improve their own programs. In line with TRIPS and EU Directive 91/250/EEC, reverse-engineering of software for the purposes of interoperability is lawful under the Intellectual and Artistic Works Law of Turkey. It is essential to preserve this kind of legitimate activities to improve the effectiveness of sector and create a competitive market.

- Due to their functional aspects, it is claimed that computer programs should be protected by patents. The attitudes of the countries towards the patentability of computer programs reflect their economic interests in protecting these creations. In this regard, the U.S., which is the biggest software producer in the world, has broadened patent protection mechanisms to include software. The EU's attitude towards software patents is less protectionist than that of the U.S. However, in its recent decisions, the Boards of Appeal of the EPO has broadened the scope of patent protection for computer programs. Taking into account structure of the software market in Turkey, which is much more composed of SME's narrow interpretation towards software patents would be much more appropriate for Turkey.

- The "technical contribution" requirement is the determinative element under the application of EPO. Despite this fact, neither the EPC nor the decisions of the Board of Appeals of the EPO have established a clear definition of this requirement. According to the European Commission, the notion of "technical contribution" may develop through case law as the technology progresses.[243] In this context, members of the EPC, including Turkey, have the flexibility to interpret this notion in favor of their own interests without violating their international commitments.

[243] Proposed Directive On the Patentability of Computer-Implemented Inventions, *supra* note 26.

CONCLUSION

In the past few years, enormous development has taken place in the area of information technologies. In parallel to these developments, protection of computer software both domestically and internationally has become important. The most common and internationally-acceptable intellectual protection form for these creations, contained in the article 10 of the TRIPS Agreement, is copyright protection. In addition, many countries around the world also grant patents for software-related inventions.

Nevertheless, the failure of the TRIPS Agreement to determine whether computer programs can be patentable or not, and if so which limitations should apply, creates different applications among the member states. The U.S, which is the biggest software producer in the world, has relaxed the subject matter criteria of software-related inventions, and now even a computer program can be patented on its own. On the other hand, software-related inventions are patentable in European Union if they produce a "technical effect." Despite the fact that "technical effect" doctrine is the core element in determining the patentability of computer software, neither the EPC nor the decisions of the Board of Appeals of the EPO have established a clear definition of this requirement.

Turkey follows the EU application not only because it is one of the contracting parties to the EPC and started the accession talks with EU in 2005, but also because it is more appropriate for Turkey. However, there is no clear consensus across the Europe on the "technical effect" notion determining the patentability of software-related inventions. Therefore, until the contracting parties to the EPC, most whom are the members of the EU, reach a common understanding, Turkey will have the flexibility to interpret this notion in favor of its own interests without violating their international commitments.