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INTERNATIONAL PROTECTION OF
COMPUTER SOFTWARE

YOSHIYUKI MIYASHITA*

TABLE OF CONTENTS

I. INTRODUCTION ............................................ 42

II. TECHNOLOGICAL BACKGROUND .......................... 43
A. HISTORY .................................................. 43
B. BASIC ARCHITECTURE OF COMPUTERS ................. 44
C. COMPUTER PROGRAMS .................................... 44

III. LEGAL DEVELOPMENT .................................... 46
A. HISTORICAL OVERVIEW ................................... 46
B. SUI-GENERIS PROTECTION V. COPYRIGHT PROTECTION ... 47
   1. The WIPO Model Provisions on the Protection of
      Computer Software .................................... 47
      a. Introduction ....................................... 47
      b. The Need for Protection ........................... 47
      d. Sui-Generis Protection ............................ 49
   2. The WIPO Special Treaty .............................. 50
   3. Amendment to U.S. Copyright Law .................... 50
   4. Another Sui-Generis Protection System: The MITI
      Proposal .............................................. 51
   5. Failure to Adopt The Draft Treaty ................... 52
C. COPYRIGHT PROTECTION SYSTEM: SCOPE OF PROTECTION 52
   1. WIPO-UNESCO Joint Research ........................ 52
   2. National Legislation and U.S. Case Law
      Developments ......................................... 53
      a. National Legislation .............................. 53
      b. Case Law Development in the United States ...... 54
D. FORMULATION OF A NEW PROTECTION SYSTEM .......... 60

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1. **Introduction** .......................................................... 60

2. **Treaty on Intellectual Property in Respect of Integrated Circuits** .............................. 60

3. **GATT and U.S. Trade Law** ....................................... 63
   a. **GATT Negotiations** ........................................... 63
   b. "**Special**" Section 301 of the Omnibus Trade and Competitiveness Act of 1988 .......... 64

IV. **PROPER FRAMEWORK FOR THE INTERNATIONAL PROTECTION OF COMPUTER SOFTWARE** ............... 65
   A. **GENERAL CONSIDERATIONS** ................................. 65
   B. **OUTLINE OF POSSIBLE LEGAL FRAMEWORK** .......... 65
   C. **SUITABILITY OF COPYRIGHT PROTECTION** ............. 68

V. **CONCLUSION: THE NEED TO ESTABLISH AN INTERNATIONAL PROTECTION SYSTEM** ............... 70

Exhibit A Basic Structure of a Computer ................................ 71
Exhibit B History of Computer Software Protection .................. 72

**I. INTRODUCTION**

Originally, computer manufacturers distributed "computer software" only as part of the whole computer system. They considered "software" to be inherently associated with "hardware." In the late 1960's, however, computer manufacturers ceased this "bundling" practice. From that moment, the software industry expanded.

Software products are quite vulnerable to "piracy." Competitors "pirate" software by making an exact copy of a program and selling it under their own label. Although software originators invest enormous amounts of time and money to develop a commercial software program, an exact copy can be made instantly and at minimal cost. Clearly, it is essential that the software industry be legally protected against piracy.

Not only does literal copying threaten the industry but "cloning," which has emerged lately, has also allegedly endangered the industry. A clone, which is not an exact copy but rather is based on a thorough study of the original software, has functions identical to those of the original software. Since cloning can save competitors the considerable research and development expenses incurred by the original software creator, it gives them a great competitive advantage.

If competitors can gain advantage so easily, companies have little incentive to develop new software. Many countries have promulgated laws restricting software piracy and cloning within their own borders.

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1. For example, in *Apple Computer, Inc. v. Franklin Computer Corp.*, (714 F.2d 1240, 1245 (3d Cir. 1983)), Apple Computer estimated that "'works in suit' took 46 man-months to produce at a cost of over $740,000, not including the time or cost of creating or acquiring earlier versions of the programs or the expense of marketing the programs."
INTERNATIONAL PROTECTION

However, as a result of economic globalization, mere domestic restrictions are no longer sufficient for software protection.\(^2\)

To cope with piracy and cloning and thereby preserve incentives for software development, a system of harmonized international legal protection for computer software should be adopted. But, what protection system should we formulate or resort to and how can we accomplish this critical end?

This Article outlines the historical background of efforts to formulate the international protection of computer software and proposes the appropriate framework for promising international protection thereof. In order to consider this proposal in its proper framework, this article will first provide a brief history as described in the following section.

II. TECHNOLOGICAL BACKGROUND\(^3\)

A. HISTORY\(^4\)

Computer “hardware” has developed at a very fast pace. Since the first general purpose electronic digital computer, the Electronic Numerical Integrator and Computer (“ENIAC”), was constructed in 1946, microelectronic technology has shown revolutionary development.\(^5\) Today, a modern electronic digital computer which is more powerful than the ENIAC can be put on a tiny silicon chip.\(^6\)

Keeping pace with the development of “hardware,” the “software” industry has also expanded significantly.\(^7\) The first step was marked by

2. As described below, this issue is one of the vital topics in the current GATT negotiations, the so-called Uruguay Round.

3. For more details about the technology of software development, see T. FORESTER, HIGH-TECH SOCIETY (1987); J. SAVAGE, S. MAGIDSON & A. STEIN, THE MYSTICAL MACHINE (1986) [hereinafter J. SAVAGE].

4. “To date computer technology has passed through several basic technological phases. The four generations of computer hardware are based on vacuum tubes, transistors, printed circuits, and finally integrated circuits.” Friedman, Copyrighting Machine Language Computer Software—The Case Against, 9 COMPUTER/L.J. 1, 3 (1989).

5. This “technological revolution—is bringing about dramatic changes in the way we live and work.” T. FORESTER, supra note 3, at 9-37.

6. In 1971, M.E. Hoff, Jr., an engineer for Intel Corporation, invented the first “microprocessor.” A microprocessor is a tiny silicon chip in which all elements of a computer are incorporated. For more discussion, see T. FORESTER, supra note 3, at 20-21; see also J. SAVAGE, supra note 3, at 34-35.

7. The term “computer software” is commonly understood to mean computer programs and “the detailed program description determining the set of instructions constituting the corresponding program and all kinds of supporting material created to aid the understanding or application of a computer program, such as user instructions.” WORLD INTELLECTUAL PROPERTY ORGANIZATION GLOSSARY OF TERMS OF THE LAW OF COPYRIGHT AND NEIGHBORING RIGHTS 53 (1980). This paper will focus solely on the issues relevant to “computer programs,” since documentation beyond computer programs has not had any significant problems in being protected as copyrighted work.
the "unbundling" of software and hardware. The real revolution in software, however, came about in the early 1980's with the rapid spread of personal computers. That leads directly to today's proliferation of packaged mass market software.

B. BASIC ARCHITECTURE OF COMPUTERS

As shown in Exhibit A, a simple computer usually consists of a central processing unit ("CPU"), primary memory, and input and output devices. The CPU is the most important part as it performs the actual calculations by following the sequences of instructions that make up computer programs. In the course of its operations, the CPU retrieves (reads) data and instructions from memory and stores (writes) data into memory. Information currently being used by the computer is stored in the primary memory which is directly accessible to the CPU. Memory devices used for the primary memory include random access memory ("RAM") and read-only memory ("ROM"). As implied by its name, ROM can be read from but can not be written into. On the other hand, RAM can be written into and stores information but only until the computer's power is turned off. Both RAM's and ROM's are semiconductor chips, or integrated circuits, manufactured through a "photolithography process."

C. COMPUTER PROGRAMS

As suggested in the preceding subsection, computers could not fulfill their expected functions without being instructed by programs. Typically, computer programs are divided by their functions into two categories. Those computer programs which are specifically designed to perform internal machine functions, such as allocation of memory space or translation of source-code to object-code (discussed below), are called operating system programs. Those programs which fulfill a specific

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8. In 1969, International Business Machines Corporation ("IBM") decided to sell hardware and software separately and announced its "unbundling" principle. See, Friedman, supra note 4, at 1-36; T. FORESTER, supra note 3, at 146.

9. In the 1980's, widespread use of so-called personal computers caused a more radical expansion of the software market. At present, the software market is a vital segment of the computer industry. For more discussion, see T. FORESTER, supra note 3, at 146.

10. J. SAVAGE, supra note 3, at 44-46.

11. Id. at 58-60.

12. Photolithography is the technology used to imprint circuits on chips. Id. at 64-65.

13. In the beginning, "switches" in a computer were actually operated manually. These manually operated switches controlled a series of connections and disconnections, on's and off's, which were used to make computers accomplish certain tasks. Computer programs are designed to eliminate such bothersome manual operation by controlling the switches and directing the computer.

14. Copyrightability of this operation system has been discussed in various jurisdic-
task are called application programs.

Computer programs are usually written first in high-level languages, such as Basic, Fortran, or Cobol, which are usually called “source-code.” Source-codes can then be translated by special programs into binary machine code, called “object-code,” which represents 1’s and 0’s, or “on’s” or “off’s” of electric current in certain parts of the circuit. The object-code may be either recorded on a magnetic device such as a “diskette” or a “floppy disk,” or expressed by circuits embedded in a ROM chip. As discussed below, since object-code is not intelligible to persons without a sufficient programming background, the copyrightability of programs in object-code format is in question—particularly by those alleged to have infringed on the copyrights of computer software.

In contrast, source-codes, also called high-level programming languages, were developed in reverse process. Originally, programmers were required to produce programs in binary machine languages (ob-


15. Originally developed and implemented at Dartmouth College in 1965, Beginner’s All-purpose Symbolic Instruction Code (“BASIC”), resembles English words. BASIC is understandable to persons unfamiliar with computers. Its similarity to the English language enables one to analogize conventional literary works to computer programs.

16. Each programming language was developed to perform certain tasks. For example, Fortran, developed under the leadership of IBM and released in 1957, was designed for scientific calculation. Cobol, developed in 1959, was designed for business purposes—such as file handling.

17. Strictly speaking, “source-code” is not always written in a high-level language. Although assembly languages are classified as low-level languages, they are written in mnemonic codes and in one of the kinds of “source-code.”

18. Those “translator” programs include “assembler,” “compiler” and “interpreter.” See J. SAVAGE, supra note 3, at 219-46.

19. In addition, there is another type of language called “microcode.” Microcode is the industry term for the software inside the microprocessor, consisting of sequences of micro instructions forming microprograms. Steinberg, Microcode—Ideap or Expression?, 9 COMPUTER/L.J. 6, 62 (1989). In NEC Corp. v. Intel Corp., (645 F. Supp. 590 (N.D. Cal. 1986), vacated, NEC Corp. v. United States, 835 F.2d 1546 (9th Cir. 1988)), copyright protection for microcode was recognized. However, the judge later disqualified himself for having a small financial interest in Intel Corp., ordering his decision vacated. On February 6, 1989, the court again decided that the Intel microcode could be proper subject for copyright protection, although it was ultimately held that Intel had lost its copyright due to the omission of copyright notice on a large number of chips. NEC Corp. v. Intel Corp., 10 U.S.P.Q.2d (BNA) 1177 (N.D. Cal 1989).

20. See, e.g., Williams Elecs., Inc. v. Artic Int’l, Inc., 685 F.2d 870 (3d Cir. 1982), where defendant Artic International contended that a copyrightable work “must be intelligible to human beings and must be intended as a medium of communication to human beings.” The court ruled for plaintiff and held that computer programs expressed in object-code and stored in read-only memory may be copyrighted.
object-codes). Machine languages are hard to manipulate even for well-trained programmers. Later, assembly languages, which are similar to machine languages, (but do allow the use of mnemonic codes) were developed to help programmers remember each instruction’s function. Subsequently, computer programs evolved into high-level languages which significantly facilitated both user and programmer access.

III. LEGAL DEVELOPMENT

A. HISTORICAL OVERVIEW

Since the early 1970’s, the World Intellectual Property Organization (‘‘WIPO’’) has played an important role in the study of the proper international legal protection of computer software and is discussed in detail in section B. As discussed in more detail in the following subsections B.1, B.2, B.5, C.1, and C.3, the WIPO’s study had four major phases: first, it published *sui-generis* model provisions; second, it pursued a special treaty; third, it researched copyright protection for software; and fourth, it prepared model copyright provisions. In summary, this study, which started from the view that *sui-generis* protection was appropriate for software protection, is about to result in the adoption of copyright protection.

About the same time WIPO pursued its study, many countries developed their own form of international software protection. They too tended to adopt copyright protection instead of *sui-generis* legal protection. This matter will be discussed further in subsections B.3 and C.2.

In addition to these recent statutory developments in copyright protection, other new international trends are developing. At the Uruguay round of talks on the General Agreement on Tariffs and Trade (‘‘GATT’’), United Nations member-states have been negotiating for a new framework for protecting intellectual property rights. In the United States, ‘‘Special’’ Section 301 of the Omnibus Trade and Competitiveness Act of 1988 was passed. The GATT talks and the ‘‘Special’’

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23. WIPO is one of the sixteen specialized agencies of the United Nations system of organizations. The overall objectives of WIPO are to maintain and increase respect for intellectual property throughout the world. WIPO, *Background Reading Material on Intellectual Property* 37-48 (1988).

24. The first legislative clarification at the national level was made in the Philippines in 1972. As part of a copyright amendment, computer programs were expressly adopted into the Decree on the Protection of Intellectual Property and equated to literary works. See Kindermann, *supra* note 22, at 201-26.

Section 301 deeply influenced the international legal framework for computer software protection. This will be discussed further in subsection D.3.

B. _Sui-Generis_ Protection v. Copyright Protection

1. _The WIPO Model Provisions on the Protection of Computer Software_

   a. _Introduction_

   In 1970, the United Nations, in an effort to facilitate developing countries' access to computer programming information,26 requested that WIPO prepare a study on the appropriate form of legal protection for computer programs and on the possibility of international agreements. As a result, from 1971 to 1977 the first extensive research on the international protection of software was pursued by WIPO’s International Bureau (“International Bureau”). The International Bureau, with assistance from the Advisory Group of Non-Governmental Experts on the Protection of Computer Programs (“Advisory Group”),27 produced the Model Provisions on the Protection of Computer Software (“Model Provisions”) which WIPO as a whole adopted in 1977. It is not a coincidence that the request was given soon after manufacturers began “unbundling” their software from hardware, thus creating a new market for software.28 As a result of the unbundling, and as suggested in the preface of the Model Provisions, it became imperative to protect computer software.29

   Although the Model Provisions have not been broadly adopted as national laws, the study supporting the Model Provisions has provided the basis for many subsequent discussions and thus deserves further review.

   b. _The Need for Protection_

   According to the preface to the Model Provisions, the development of computer software requires “large-scale investment”30 and “is estimated to account for by far the greater part of the total cost of computer systems.”31 In addition, the “total expenditure on computer

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27. The Advisory Group’s meetings consisted of four sessions: the first session was held June 17-20, 1974; the second session was held June 23-27, 1975; the third session was held May 17-21, 1976; and, the fourth session was held June 1-3, 1977. _Id._ at 259.
28. See Friedman, _supra_ note 4, at 4; see also T. Forrester, _supra_ note 3, at 146.
30. _Id._ at 260.
31. _Id._
software will constantly increase." Problems arise because some forms of computer software are vulnerable to piracy. In fact, a computer software package is "expensive to prepare and easy to copy . . . ."

In view of this vulnerability, the International Bureau stressed that providing legal protection for computer software would produce at least two advantages for encouraging dissemination of software. First, if software proprietors could rely on legal protection instead of confidential disclosure contracts, they would have incentive to disclose the software. This would ensure the ready accessibility of an important form of modern technology and facilitate exploitation of software. Second, by increasing the legal security of the relationship between the parties to a software sale or licensing agreement, the Model Provisions would facilitate such transactions. Therefore, the dissemination of software would be encouraged. The International Bureau's emphasis and the wording of the Model Provisions reflect the primary purpose of the study, i.e., promoting dissemination of software to developing countries.


The Model Provisions were clearly prompted by the desire to en-
courage software use and dissemination in developing countries. Never-
theless, the International Bureau did not necessarily adopt every con-
ceivable incentive to encourage such use and dissemination. For ex-
ample, the Model Provisions did not make software protection depen-
dent upon its registration or upon compliance with other formalities,
such as the marking of the computer software. Yet, such require-
ments as mandatory deposit, compulsory registration or a formality re-
qurement would have resulted in the disclosure of some information re-
lated to the computer software and thus promote the dissemination of
computer software. Why did the Model Provisions refuse to accept these
mandatory systems?

Apparently, the International Bureau was concerned with the in-
terests of the software industry. The International Bureau pointed out
in the preface to the Model Provisions that, "in view of the relative dif-
culty of detecting misappropriations of a computer program, . . . un-
restricted disclosure to the public is not desirable." The International
Bureau reasoned that "compulsory formalities would not be in the in-
terest of the small software enterprises or individual users, who might
be unaware of the need to comply with them." Thus, the Interna-
tional Bureau did not choose a patent law approach under which the
rights would be granted subject to an adequate disclosure to the public
and upon appropriate examination. Instead, the Model Provisions es-
entially adopted "a copyright law approach which takes account of
their subject matter's affinity with copyright protection."

d. Sui-Generis Protection

Another outstanding characteristic of the Model Provisions is their
sui-generis form of protection. While the International Bureau stated
in the preface of the Model Provisions that "the model provisions
should not be understood as necessarily requiring adoption in a separate
law on the protection of computer software," the Model Provisions
were apparently aimed at formulating sui-generis protection which
would necessitate a special treaty for computer software protection.
The sui-generis form of protection seems to presuppose that existing
treaties are inadequate to protect computer software.

\textit{Id.} at 262.
\textit{Id.} at 261.
\textit{Id.} at 263.
\textit{Id.} at 261.
\textit{Id.} at 264.
2. *The WIPO Special Treaty*

In November 1979, the Expert Group on the Legal Protection of Computer Software ("Expert Group") examined in detail what the contents of a treaty for the protection of computer software might be and agreed that the question of the desirability of a special treaty for the protection of computer software should be further studied. In pursuit of an in-depth study, the Expert Group recommended that the International Bureau prepare a questionnaire to be distributed to each member country which would uncover problems that would be encountered in the international protection of computer software.

In accordance with this recommendation, the International Bureau conducted a survey, from 1979 to 1983, concerning the desirability and feasibility of a treaty for the protection of computer software. Based on the survey, the International Bureau prepared the Draft Treaty for the Protection of Computer Software ("Draft Treaty").

Apparently, the Model Provisions were not incorporated into the Draft Treaty. But, the Draft Treaty, like the Model Provisions, was intended to formulate a *sui-generis* protection of computer software. Its ultimate end was to eliminate uncertainty existing at that time with respect to the available form of international protection. Underlying this approach was the recognition that both the Berne Convention and Universal Copyright Convention were silent about the question of whether computer software was a "work" which could be protected under those conventions; and that the Paris Convention did not require member countries of the Union to grant patents for computer software.

3. *Amendment to U.S. Copyright Law*  

While the above-referenced study aimed at formulating *sui-generis* protection was conducted by WIPO, a different legal system was developed in the United States.

In 1979, the year following the publication of the Model Provisions, the National Commission on New Technological Uses of Copyrighted Works ("CONTU") filed a final report ("CONTU Final Report") with

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41. See Note, *Expert Group on the Legal Protection of Computer Software—First Session*, 16 COPYRIGHT: MONTHLY REV. WIPO 36 (1980). The Expert Group noted that the provisions of the Paris Convention and the Berne Convention did not fully cover the protection which should be granted to computer software.


43. In 1964, the Register of Copyright of the United States first accepted computer programs for registration. The acceptance, however, did not mean the Copyright Office wholeheartedly endorsed the copyrightability of computer programs. Friedman, supra note 4, at 2-3, 6.
INTERNATIONAL PROTECTION

the United States Congress. Unlike the International Bureau of WIPO, CONTU did not choose *sui-generis* protection but recommended that copyright law be amended to “make it explicit that computer programs . . . are proper subject matter of copyright.”

In 1980, pursuant to this recommendation, the Congress amended the 1976 Act to add the definition of the term “computer program” to the U.S. copyright laws. The United States’ adoption of this approach significantly influenced the WIPO Committee of Experts on the Legal Protection of Computer Software’s appraisal of the Draft Treaty, as discussed below.

4. Another Sui-Generis Protection System: The MITI Proposal

By adopting the copyright law approach, the WIPO Model Provisions made software protection independent of software disclosure. The preface of the Model Provisions, however, suggested that there might be another *sui-generis* system for protecting computer software based on the patent law approach. In 1982, the Ministry of International Trade and Industry Japan (“MITI”) proposed that Japan should adopt a patent law approach to software protection.

According to the MITI proposal, *sui-generis* law should be enacted as follows:

(i) limit protection to only fifteen years after the program has been written;
(ii) set up a registration system for programs similar to that used for patents;
(iii) give the MITI power to order compulsory licensing of programs; and,
(iv) set up guidelines to require the program owner to disclose some details of the program when sold.

For the purpose of “promoting dissemination of software to developing countries” as set forth in the preface to the Model Provisions, the MITI’s proposed provisions seem more suitable than the Model Provisions themselves. On the other hand, the MITI provisions would be “particularly onerous to the countries that have a head start in [software] technology.” In fact, the MITI proposal was widely criti-

46. Pub. L. No. 96-517, 94 Stat. 3028 (1980). According to the amendment, a “computer program” is defined as “a set of instructions to be used directly or indirectly in a computer in order to bring about a certain result.” See 17 U.S.C. §§ 101-117 (1988).
47. See Prasinos, supra note 22, at 196-99.
48. Id.
49. Id. at 197.
cized, especially by the United States and the EEC Commission.\textsuperscript{50} Even in Japan, the Ministry of Cultural Affairs and Education strongly criticized the MITI proposal and in its turn proposed a revision of the Japanese copyright law to specify that computer software was within the framework of copyright.\textsuperscript{51}

5. \textit{Failure to Adopt the Draft Treaty}

In 1983, the Draft Treaty was presented at the Second Session of the Committee of Experts on the Legal Protection of Computer Software ("Committee"),\textsuperscript{52} but failed to gain sufficient Committee support.\textsuperscript{53} The Committee found an "increasing trend at the national level in a certain number of countries of granting protection under copyright law to computer software."\textsuperscript{54} The Committee participants agreed that they should no longer attempt to finalize the Draft Treaty but should instead pursue a study on the protection available under existing national copyright laws and treaties.

In 1985, WIPO, jointly with the United Nations Educational, Scientific and Cultural Organization ("UNESCO"), undertook this study and convened a meeting of the Group of Experts on the Copyright Aspects of the Protection of Computer Software ("Copyright Experts Group") as discussed below.

\textbf{C. Copyright Protection System: Scope of Protection}

1. \textit{WIPO-UNESCO Joint Research}

In February 1985, the Secretariat of UNESCO, one of the specialized agencies of the United Nations, and the International Bureau of WIPO jointly convened a meeting of the Copyright Experts Group to discuss the applicability of copyright law to computer programs.\textsuperscript{55} At this meeting, it was recognized that there was "a continuing general tendency to consider computer programs as works protected by copyright [among nations]."\textsuperscript{56} However, according to a report entitled "Legal Protection of Computer Programs: A Survey and Analysis of

\textsuperscript{50} See Kindermann, \textit{supra} note 22, at 201-26.
\textsuperscript{51} Id. In the end, the counterproposal of the Ministry of Cultural Affairs and Education prevailed against the MITI proposal and, in 1985, the copyright law of Japan was amended to clarify the copyrightability of computer programs.
\textsuperscript{53} The Committee recommended "that the consideration of the conclusion of a special treaty as presented to it should not be pursued for the time being." Id. at 278.
\textsuperscript{54} Id. at 272-74, 278.
\textsuperscript{56} Id. at 147.
National Legislation and Case Law”, which was presented by the Secretariats of WIPO and UNESCO at the meeting, such a tendency was still not dominant. Brazil, Greece and the Union of Soviet Socialist Republics had reportedly considered the adoption of a sui-generis system for computer programs. In addition, copyright protection was still under study in Australia, Canada, China, France, Israel and the Netherlands. Thus, intense research had revealed that the perceived “general tendency” toward copyright protection was in reality unstable. In the final analysis, the research findings showed that, as of that time, there were no immediate and effective means with which to achieve a harmonized international protection system.

a. National Legislation

Subsequent to the meeting of the Copyright Experts Group, the applicability of copyright law to computer programs was discussed at the extraordinary session of the Executive Committee of the Berne Union (“Executive Committee”) in June 1985. By that time, the “general tendency” toward using copyright protection was further advanced and appeared to be more stable. Shortly before the meeting, the Federal Republic of Germany and Japan adopted amendments to copyright law which explicitly mentioned the copyrightability of computer programs. Further, in the United Kingdom, Canada and France, such amendments were reportedly in the process of being adopted. Under these circumstances, no longer did it seem prudent and practical to insist on establishing a sui-generis international protection system. Instead, the Executive Committee decided it was more productive to discuss the substantive points of copyright law, including the scope of protection under the copyright law system and the necessity of revising the Berne Convention. Despite these advances, the copyright approach still did not officially prevail over the sui-generis approach. The participants on the

57. Mr. Michael S. Keplinger of the United States prepared this document in accordance with a request made jointly by WIPO and UNESCO. See id. at 146, 153-57.
58. Id. at 153-57.
59. According to the survey, Denmark, Finland, the Federal Republic of Germany, Ireland, Japan, Norway, Spain, Sweden and the United Kingdom were planning to adopt the copyright protection with or without amendment to their copyright laws. In India, an amendment to the copyright law was made in 1984 by which computer programs qualified as literary works. Report, Executive Committee of the International Union for the Protection of Literary and Artistic Works (Berne Union), 23 COPYRIGHT: MONTHLY REV. WIPO 268, 276 (1987). See also id. at 268-77.
60. See id. at 276, 280-82.
61. In July 1985, both France and the United Kingdom adopted the copyright law amendment. See Kindermann, supra note 22, at 206-07. In 1987, a copyright law amendment bill was reportedly introduced in Canada. See id. at 213.
Executive Committee only agreed "to follow the developments both at national and international levels and regularly report on them to the Committees."\(^{62}\)

b. **Case Law Development in the United States**\(^{63}\)

In the United States, on the other hand, the key issue was no longer which form of copyright protection to use for computer software but what the scope of this protection should be. While the 1980 Copyright Law Amendment made it "explicit that computer programs . . . are proper subject matter of copyright,"\(^{64}\) it could not encompass all potential cases that might come before the courts. Because the copyright law did not clarify the appropriate scope of protection, courts were called upon to develop such a definition. Thus, the adoption of copyright protection was only a first step which led to the following material questions on the scope of protection:

(i) Whether or not computer programs expressed in object-code format are copyrightable;
(ii) Whether or not computer operating system programs are copyrightable;
(iii) Whether or not copyright protection extends to structure, sequence and organization of a computer program; and,
(iv) Whether or not the audiovisual or pictorial displays are protected under the Copyright Law.\(^{65}\)

i. **U.S. copyright law and object-code operating systems:** The first two questions are generally raised in actions against literal copying, i.e., traditional piracy. Those questions were discussed in *Apple Computer, Inc. v. Franklin Computer Corp.*\(^{66}\) In this case, the defendant, Franklin Computer, incorporated an operating system program, which was developed by Apple for "Apple II" computers and embedded in a ROM chip, into its own "Apple compatible" computers. The only difference between the Franklin operating system and the original operating system was that Franklin's program would not indicate Apple's copyright notice on the display screen when operated. In view of the enormous investment Apple made to develop the original operating system, it was clear that Franklin's business practice was unfair and should be prohibited. The defendant, however, presented several strong arguments in

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62. \textit{Id.} at 282.
64. CONTU FINAL REPORT, supra note 44, at 1.
65. In addition, copyrightability of "microcode" must be noted. See supra note 20 and accompanying text.
favor of its actions. First, copyrightable work must be intelligible to human beings and intended as a medium of communication. The Apple object-code program, which the defendant used to create its own program, was not readily human readable. Second, since operating system programs are purely utilitarian works and are considered to be uncopyrightable ideas, operating system programs are disqualified from copyright protection. These arguments highlighted the significant differences between traditional literary works and computer programs. Suddenly, there was a question as to whether copyright protection of computer programs would always apply. The arguments against copyright protection as presented by Franklin seemed plausible. However, the court denied Franklin's arguments and held that:

(i) a computer program in object-code embedded in a ROM chip was an appropriate subject of copyright; and
(ii) the Apple operating system programs were not uncopyrightable processes, methods of operations or purely utilitarian works, because the Copyright Act makes no distinction between application programs and operating programs.

This decision was rational, not only because it complied with the legislative intent underlying the copyright law, but also because it satisfied an urgent need to regulate conduct that appropriates others' assets after they already invested the thought and dollars necessary to develop that asset. Except for copyright protection, there was no effective and sufficient way to regulate such conduct in this field. The only way to protect Apple was the adoption of copyright protection.

ii. U.S. copyright law and "clone" programs - protection of program structure: Referring back to the questions raised when the U.S. adopted the Copyright Law Amendment, the last two questions on the scope of protection under copyright law have emerged recently, involving "clone" programs. Clone programs have functions identical to those of the original program. They are usually created by making a thor-

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67. While the traditional literal works are designed to be read by a human reader, a computer program in object code format can only be "read by an expert with a microscope and patience." Apple Computer, Inc. v. Franklin Computer Corp., 714 F.2d 1240, 1243 (3d Cir. 1983). This argument was originally made by the defendant in Williams Elec. Inc. v. Artic Int'l, Inc., 685 F.2d 870, 877 (3rd Cir. 1982). Disagreeing with the argument, the Williams court accepted the copyrightability of object code programs.


69. 714 F.2d at 1249-52.

70. See supra note 65 and accompanying text.

71. A clone is produced by mimicking the essential structure of the software. There-
ough study of the original program and then a copy of the structure, sequence or organization of the original program. The key question is whether the creator of the original program should be given exclusive right to the structure, sequence or organization of the original program. In Whelan Associates, Inc. v. Jaslow Dental Laboratory, Inc., the court permitted such an exclusive right, holding that “copyright protection of computer programs could extend beyond the programs’ literal code to their structure, sequence, and organization.” Unlike the Apple case, Jaslow did not copy but instead developed a computer program which had functions identical to Whelan’s program, but was written in a different programming language. The two programs, when written out, appeared totally different. In view of the Apple decision, the Whelan court could not conclude that Jaslow reproduced Whelan’s program itself. In order to protect Whelan, the court needed to extend copyright protection for software to its structure, sequence, and organization. But, why did the Whelan court decide to protect Whelan?

The court stated in the Whelan decision: “among the more significant costs in computer programming are those attributable to developing the structure and logic of the program.” Therefore, the extension of copyright protection “would provide the proper incentive for programmers by protecting their most valuable efforts.” As the court pointed out, “[a] program’s efficiency depends in large part on the arrangements of its modules and subroutines.” In other words, the program’s structure, sequence, and organization are its distinctive characteristics.

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72. Id.
73. Id. at 1248.
74. In this case, Jaslow Laboratory first hired Whelan to develop software that would automate Jaslow Laboratory’s management. After studying Jaslow Laboratory’s operations, Whelan created a program written in a computer language known as EDL (Even Driven Language). Then, under an agreement, Jaslow Laboratory became Whelan’s sales representative for the program. However, sensing that there might be a market for a program that served essentially the same function as Whelan’s program but that could be used more widely, Jaslow Laboratory developed and marketed a clone program written in BASIC. See id. at 1225-27.
75. Id. at 1237.
76. Id.
77. Id. at 1230.
78. On the other hand, the court stressed computer programs’ affinity with traditional literary works, and stated that “[t]he copyrights of other literal works can be infringed even when there is no substantial similarity between the works’ literal elements” and “[o]ne can violate the copyright of a play or book by copying its plot or plot devices.” Id. at 1234.
However, since the progress of computer programming "is achieved by means of 'stepping-stones,' a process that 'requires plagiarizing in some manner the underlying copyrighted work,'" protection of computer programs beyond their literal code may retard progress in the field of computer programming.\textsuperscript{79} Besides, even if protection should be afforded to computer programs, questions remain as to whether copyright law can be, or should be, used to protect the elements of a computer program; and, if so, whether copyright protection is appropriate for such purpose. Those problems are discussed below.

iii. \textit{U.S. copyright law and "clone" programs-protection of screen display:} Copyright protection of the computer program's structure, sequence, and organization is not the only way to prevent "clone" programs from spreading. Copyright protection of audiovisual or pictorial displays will also effectively discourage "clones." In \textit{Broderbund Software, Inc. v. Unison World, Inc.},\textsuperscript{80} the court showed preference for the \textit{Whelan} holding, and stated that "copyright protection is not limited to the literal aspects of a computer program, but rather that it extends to the overall structure of a program, including its audiovisual displays."\textsuperscript{81} In this case, the defendant, Unison World, created a "clone" program which generated menu screens that were virtually identical with those of the plaintiff's program. The court held that this violated the copyright laws.

Although the outcome of the \textit{Broderbund} case should have been beneficial to the software industry, this holding seemed to confuse the issues. Certainly, audiovisual displays generated by a computer program may be protected by copyright law as the court suggested, but it is not because the displays are generated by "a computer program;" rather, it is because the displays are considered to be an independent creation. Whether the work "is produced with the aid of a pen, pencil, or computer" is not crucial.\textsuperscript{82} Furthermore, if, as the court decided, copyright protection of a computer program should extend to its screen displays, that would ruin the basic principle underlying copyright law, \textit{i.e.}, the distinction between expression and "idea." The copyright law protects only "expression." The idea behind expression is not a copy-

\begin{itemize}
  \item \textsuperscript{79} Id. at 1238.
  \item \textsuperscript{80} 648 F. Supp. 1127 (N.D. Cal. 1986).
  \item \textsuperscript{81} Id. at 1133.
  \item \textsuperscript{82} Friedman, \textit{supra} note 4, at 12. At the same time, we must realize that there exists a significant difference between the display created by computer programs and the other works produced with "pen" or "pencil." Computer displays are, in some cases, deemed to express not only the visible elements appearing on the screen but also invisible elements behind the screen. The menu screen on a computer display expresses some function of the program, \textit{i.e.}, the menu screen signifies that once one chooses a given task on the menu, the computer will accomplish that task.
\end{itemize}
right matter. The Whelan court's ruling did not radically depart from
the principle since the arrangement of modules, subroutines or struct-
ure, sequence, and organization may be deemed expressed in a com-
puter program. In contrast, screen displays to be generated by the
program are undoubtedly not expressed in the program. The screen
displays are the result or objective of the program, an element of an
"idea." The reasoning of the Broderbund decision is hardly persuasive,
although the result of this case is reasonable. Quite possibly, the
Broderbund case overlooked one of the distinctive features of computer
programs: a computer program is expression which generates another
expression. In fact, the Broderbund holding was rejected by Digital
Communication Associates, Inc. v. Softhlone Distributing Corp.83 In
this case, the court correctly held that screen displays were not "copies" or
"reproductions" of literary or substantive content of computer pro-
grams. The court thus held that the computer program underlying Digital's screen displays was not protectable copyright, but the screen
displays themselves were copyrightable. Whether screen displays are
protected by the underlying program has not been of great importance
in subsequent cases; rather, courts have focused on what substantive
standard should be used to decide the copyrightability of the screen
displays.84

3. Model Provisions for Copyright Legislation

While U.S. courts unveiled the distinctive nature of computer pro-
grams and sought substantive standards for software protection, inter-
national trends toward adopting copyright protection continued.85 In
view of stable trends, the International Bureau prepared draft provi-
sions for copyright protection on computer programs and included those
provisions into its "Draft Model Provisions for Legislation in the Field
of Copyright" ("Copyright Model Provisions") which was presented at

(D. Mass. 1990), two alternatives were mentioned: a test based on "look and feel," a wide-
spread concept in public discourse on the copyrightability of computer programs, and a
"three-element" test adopted by the court. As the court pointed out, the term "look and
feel" is certainly too vague to be usable standard, though the term seems to underscore
the goal of the copyright protection on screen displays. Going through the "three-ele-
ment" test, basically a test to detect and analyze essential elements of screen displays, one
can decide whether the "look and feel" of the displays are copyrightable.
85. In 1986, the Dominican Republic passed a copyright law which included computer
programs in the catalog of copyrightable works. In 1987, Spain, Indonesia, Malaysia and
Singapore, respectively, adopted copyright laws which ruled that computer programs were
included among copyrightable works. See Kindermann, supra note 22, at 209, 212-13. See
also Report, supra note 59, at 268-77. In addition, Denmark, Sweden and Israel have re-
cently adopted copyright protection for computer programs. Id. at 259-69.
the first session of the Committee of Experts on Model Provisions for Legislation in the Field of Copyright ("Copyright Model Provisions Committee") held in February-March 1989.86

The purpose of establishing the Copyright Model Provisions is not solely to provide copyright protection for computer programs. The emergence of various new types of works, including computer programs, phonograms, and computer-generated works, caused discrepancies in views with respect to the scope of copyright protection at both international and national levels. This prompted a desire to clarify the scope of the subject matter covered by copyright and set forth appropriate standards for copyright protection on such new works. These issues were discussed at the meeting of the Committee of Governmental Experts on the Evaluation and Synthesis of Principles on Various Categories of Works held June 27 to July 1, 1988.87 The Copyright Model Provisions Committee met to further these discussions.

At the first session of the Copyright Model Provisions Committee, the key issue was the copyrightability of computer software. Faced with "the dominating trend" towards adopting copyright protection, opponents of copyright protection faltered.88 In fact, at the third session of the Copyright Model Provisions Committee, all participants agreed that computer programs should be protected by copyright.89 It may be asserted, therefore, that the copyright approach will prevail against the sui-generis approach.

However, the mere adoption of copyright protection will not meet the ultimate goal. As shown in U.S. case law developments, even when computer programs are protected by copyright law, the scope of that protection is not always clear. Significant differences exist between computer programs and traditional literal works. Within the copyright framework, we need to further determine the substantive standards for software protection. A harmonized international legal system must

86. The Copyright Model Provisions Committee, convened by the Director General of WIPO, is expected to identify the questions with which the studies for the establishment of a possible protocol to the Berne Convention should deal. See Note, Committee of Experts on Model Provisions for Legislation in the Field of Copyright, 25 COPYRIGHT: MONTHLY REV. WIPO 146 (1989).


88. Only three delegations, namely Algeria, Brazil and Czechoslovakia, "expressed doubts whether copyright protection of computer programs was an appropriate solution and, thus, whether any provisions on such a protection would be justified in the model provisions." Eighteen delegations "supported the inclusion of provisions in the model provisions on the copyright protection of computer programs." Note, supra note 86, at 148-49.

then be formulated based on these standards. However, these courses of action will take a long time.

D. FORMULATION OF A NEW PROTECTION SYSTEM

1. Introduction

Providing adequate protection for computer-related technology is so crucial that a number of attempts to formulate an international protection system have been made. Among these attempts, a treaty relating to integrated circuits, GATT negotiations and "Special" Section 301 of the Omnibus Trade and Competitive Act of 1988 are particularly noteworthy. Since a history of the integrated circuits treaty seems to suggest underlying problems in formulating an international software protection system, its brief history will be discussed in the following subsection.

2. Treaty on Intellectual Property in Respect of Integrated Circuits

On May 26, 1989, a treaty entitled "Treaty on Intellectual Property in Respect of Integrated Circuits" ("Integrated Circuits Treaty") was adopted by the Diplomatic Conference for the Conclusion of a Treaty on the Protection of Intellectual Property in Respect of Integrated Circuits.\(^9\) The Conference was organized and convened by the WIPO in Washington, D.C.\(^9\) The Treaty was designed to establish *sui-generis* protection for "layout-design" (topography). Layout-design encompasses such things as the three dimensional disposition of the elements and interconnections of an integrated circuit.\(^9\) Integrated circuits, or semiconductor chips,\(^9\) which include RAM's, ROM's and microprocessors, are not computer programs themselves but may be considered to be media for storing or processing the programs. Protection on "layout-design (topography)" is deeply associated with software protection, but it is never a substitute for software protection. Nor does the software protection extend to "layout-design."

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92. According to Article 2 (ii) of the Integrated Circuits Treaty, "‘layout-design (topography)’ means the three-dimensional disposition, however expressed, of the elements, at least one of which is an active element, and of some or all of the interconnections of an integrated circuit, or such a three-dimensional disposition prepared for an integrated circuit intended for manufacture." *Id.* at 192.

93. Strictly speaking, an integrated circuit is not inevitably a semiconductor chip. However, in view of current technology, both terms have virtually the same meaning. *See id.* at Art. 3(1)(c).
The necessity of integrated circuit protection was first considered on an international level during discussions on software protection. In June 1983, at the second session of the Committee of Experts on the Legal Protection of Computer Software, participants recognized the urgent need for protection of integrated circuits. After intense discussion, the Committee recommended that the WIPO proceed with the study. Thus, in a sense, the Integrated Circuit Treaty is a derivative product of discussions on software protection. However, the substance of the protection system is significantly different.

First, the Integrated Circuit Treaty adopted a *sui-generis* protection system, while *sui-generis* protection has not prevailed for protecting software. Almost all countries which protect the layout-design or mask works also adopted *sui-generis* protection. Usually, the layout-design or mask works are considered to be purely utilitarian and therefore outside the scope of copyright protection. This is commonly seen as the essential reason that *sui-generis* protection prevailed. However, the preference of *sui-generis* protection over copyright protection was not a logical consequence. In fact, the initial plan in the United States, the country which seemingly led the rest of the world to establish *sui-generis* protection for integrated circuits, was only to amend the copyright law. The decisive factor did not seem to be the nature of the mask works but instead the substantive standards suitable for effective protection.

Second, the Integrated Circuit Treaty permits the contracting party to adopt a mandatory registration system (Article 7(2)). In contrast, the Berne Convention for the Protection of Literary and Artistic Works ("Berne Convention") generally prohibits member countries from having national treatment dependent on formality. In addition, the

95. Id. at 277-79.
97. Those countries which protect layout-design of a chip include the United States, European Community countries, Japan, Canada, Australia, and Sweden. COPYRIGHT (issued by Copyright Research Institute of Japan), July 1989, at 18. It must be noted that instead of directly protecting layout-design, those countries protect “mask works.” A mask is the stencil that is used to create the different layers of the chips. See Wadley, supra note 42, at 12.
99. Berne Convention for the Protection of Literary and Artistic Works, Sept. 9, 1886,
Berne Convention principle contrasts with the Paris Convention for the Protection of Industrial Property ("Paris Convention"). The Paris Convention presupposes that member countries maintain a mandatory registration system. Thus, the Integrated Circuit Treaty's principle lies between the Paris and Berne Conventions.

In addition, while the Berne Convention provides that the duration of protection shall be at least the life of the author plus fifty years following the year of his death (Article 7), the Integrated Circuit Treaty's protection term is only eight years.

Another distinguishable character of the Integrated Circuit Treaty is its scope of protection. The Integrated Circuit Treaty explicitly permits so-called "reverse-engineering" and, further, allows the contracting party to adopt a non-voluntary license system (Article 6(3)). These characteristics are not found in the Berne Convention.

In addition, the Integrated Circuit Treaty introduced a unique dispute settlement system (Article 14). The Integrated Circuit Treaty states: (i) a contracting party may request another contracting party to enter consultations with it in order to settle disputes between them (Article 14(a)); upon agreement, the parties may resort to other means, such as good offices, conciliation, mediation and arbitration for amicable settlement (Article 14(2)); and, (iii) if the above means do not lead to an amicable settlement, a panel of three members to be selected from a list of governmental experts shall, at the written request of either of the parties, deal with the dispute (Article 14(3)). Both the Paris and Berne Conventions have been criticized in that neither convention provides an effective means for resolving disputes. The inclusion of the above dispute settlement provisions seemingly responds to such criticism.

Given these novel provisions, the Integrated Circuit Treaty faces objections from both the United States and Japan, the two countries that dominate the semiconductor chip market. The imbalance of...
technology makes it too difficult to gain universal consensus on the substantive standards for protection of "layout-design." This imbalance of technology can be seen not only in the field of integrated circuits, but also in the field of computer programs. Therefore, it is reasonable to expect that further discussions on software protection will confront the same situation, which may retard progress in establishing an international protection system.

3. **GATT and U.S. Trade Law**

   **a. GATT Negotiations**

   Debate over the issue of international protection of computer software is not limited solely to WIPO or UNESCO; it is also vigorously discussed in the current round of GATT talks, namely the Uruguay Round.

   While previous rounds concentrated on reductions in tariffs and quotas, the Uruguay Round includes trade-related aspects of intellectual property rights for the first time. An underlying cause for the inclusion of this topic is the computer industry's impatience with WIPO's slow progress in formulating an appropriate international protection system for computer software. WIPO has studied and discussed this issue for nearly twenty years, and has yet to solve even the threshold question, i.e., the form of the protection. In addition, increased expectations for GATT may be indicative of the industry's dissatisfaction with the current legal framework, based largely on the Paris and Berne Conventions, neither of which has "any effective enforcement mechanism to compel states to introduce laws on intellectual property and to enforce such laws in a non-discriminatory manner."

   However, reliance on GATT would not be an immediate solution to the problem. The foremost barrier to the establishment of an international legal protection system of computer programs is neither the lack of enforcement mechanism nor the inability of WIPO. Instead, the imbalance of technology, that is, conflicting interests of developed and developing countries, has most hampered international legal development in this field. Thus, it is inconceivable that GATT would provide an immediate and effective solution to this problem. The mere change of forum will never solve the imbalance.

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*protection period is shorter than that in the United States and some other countries; and 3) the dispute settlement system may lead to an unfair settlement due to political reasons. See COPYRIGHT (issued by Copyright Research Institute of Japan), Aug. 1989, at 13.*

104. Korn, supra note 102, at 2-3.

105. *Id.* at 3.
b. "Special" Section 301 of the Omnibus Trade and Competitiveness Act of 1988

On August 23, 1988, the United States Congress enacted the Omnibus Trade and Competitiveness Act of 1988 ("Omnibus Trade Act of 1988"). The Omnibus Trade Act of 1988 was, among other things, designed to create a system to impose trade sanctions against nations that inadequately protect intellectual property. The so-called "Special" Section 301, which is an amendment to Section 301 of the Trade Act of 1974, was integrated into the Omnibus Trade Act of 1988 for accomplishing such a purpose. "Special" Section 301 was designed to enhance the Administration's ability to negotiate improvements in foreign intellectual property regimes. "Special" Section 301 has several important functions. First, the United States Trade Representative ("USTR") must identify those foreign countries that deny adequate and effective protection on intellectual property rights and market access to U.S. firms which rely on such protection, and determine which of those countries are "priority countries." Once a country is identified as a priority country, the USTR must promptly initiate an investigation which must be completed within six months after date of initiation. Upon a determination that a priority country denies adequate and effective protection, the USTR may impose trade sanctions.

The system created by "Special" Section 301 may significantly influence the international legal system for protecting computer software. Since the trade sanctions to be imposed by the USTR are so powerful, the United States may force other countries to introduce an equally protective system in order to meet the United States' standards. Thus,

108. The previous Section 301 had "authorized" the United States Trade Representative ("USTR"), subject to the President's specific direction, to impose duties or other import restrictions in response to certain unfair trade practices. See Smith, supra note 107, at 9.
110. The term "priority foreign countries" means those foreign countries identified by the USTR as (i) denying adequate and effective protection of intellectual property rights, or (ii) denying fair and equitable market access to United States persons that rely upon intellectual property protection. 19 U.S.C.A. § 2242 (West Supp. 1990). See 1 Copyright L. Rep. (CCH) ¶ 11454 (1988).
111. See Hoffman & Marcou, supra note 107, at 134.
"Special" Section 301 may assure an international software protection system.

Nonetheless, we should not rely on "Special" Section 301's powerful, yet dangerous, scheme. There is no assurance that trade sanctions will be imposed on "reasonable" grounds. What is "reasonable" for one country is not necessarily "reasonable" for another country. "Special" Section 301, which was designed to eliminate "unfair" trade practices, may instead provide an "unfair" burden on other countries.

IV. PROPER FRAMEWORK FOR INTERNATIONAL PROTECTION OF COMPUTER SOFTWARE

A. GENERAL CONSIDERATIONS

As discussed above, copyright protection for computer programs continues to be the dominating trend in national law. Moreover, the International Bureau's Model Provisions will include sections which make explicit that computer programs are proper subject matter for copyright. However, in order to formulate a truly harmonized international protection system, it seems necessary to review why national laws and courts have tended to adopt copyright protection. In order to give due consideration to this issue, a brief description of the other possible legal frameworks will be provided in subsection (2), and, then, the suitability of copyright law for the protection of computer software will be discussed in subsection (3). Finally, based on this discussion, commentary on the future course of action for formulating an international protection system will be made below.

B. OUTLINE OF POSSIBLE LEGAL FRAMEWORK

In addition to legal protection under copyright law, other possible methods for protecting computer software include: (i) protection under patent law; (ii) protection of the program as a trade secret; (iii) contractual protection; (iv) protection under unfair competition law; and, (v) protection under special legislation.

Among these methods, patent protection is ordinarily unavailable and unsuitable for computer software, although some commentators as well as some jurisdictions suggest the possibility of protecting computer software under the patent system. For the reasons described below, patent protection is too difficult to apply to computer programs written in presently conceivable languages. Thus, patent protection does not seem feasible for adequate protection of computer programs.

Patent law is intended to protect "inventions" which are new, involve inventive steps and are industrially applicable. Although a computer program may be deemed new and industrially applicable, the program itself would hardly involve an inventive step, and, therefore, would not be an "invention." Computer programs are developed by accumulating and arranging instructions and data. Each individual instruction and data incorporated within a computer program is alone so simple that it is difficult to find an inventive step within the elements of the computer program, i.e., each instruction and data. Therefore, in order to conclude that a computer program involves an inventive step, that inventive step must be found in the arrangement of instructions and data. However, under patent law, a new creation that employs the use of existing elements must generate an unexpected result in order to be patentable; the arrangement of instructions and data comprising a computer program leads to the expected result. Without altering the concept of "inventive step," it is quite hard to conclude that the program is patentable.

In addition, the preface of the Model Provisions rightly suggests that unrestricted disclosure to the public—a fundamental principle of patent law—is not desirable for software protection in view of the relative difficulty in detecting misappropriations of a computer program.

Moreover, the scope of protection under patent law is somewhat problematic. Under patent law, the patented invention may not be used by third parties without the authorization of the patentee, even if the third party has independently developed the same invention. This broad application of patent law to computer programs would require that computer program developers undertake extensive research to determine whether previous registration of an identical program already exists. Such a requirement would hamper dissemination of computer software and, as a result, progress in this field. Therefore, it is prudent not to stress the possibility of protecting computer programs under the patent system.

Another possible method for protecting computer software may exist under trade secret law. This method may be especially appropriate for the protection of computer programs developed in an enterprise. Pursuant to trade secret law, persons who owe a fiduciary duty to the enterprise are prohibited from disclosing confidential information related to the program.

However, this method would become inoperative once the fiduciaries disclosed the program to the public since trade secret law does not

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apply to third parties who do not have confidential obligations to the enterprise. As a result, the scope of protection of computer programs would not be defined and, thus, no distinction would be made between permissible reliance on the idea underlying the program and infringement upon the author's rights. In order to balance protection for computer programs (to provide the incentive to develop new technology) with the dissemination of technology (to facilitate technological development) it is vital to clarify the scope of protection for computer programs.

Furthermore, even contractual protection would be insufficient to create an efficient and productive balance between protection for and dissemination of technology. Contracts are not designed to provide universally applicable standards. Rather, a contract is a product of compromise between the parties to the contract. In addition, since contractual protection cannot be claimed against third parties outside the scope of the contractual relationship to cope with piracy committed by a third party, the adoption of another protection system is inevitable. Further, one should note that if legal protection is insufficient to meet the computer industry's needs, the industry will likely attempt to restrict software use in its own agreements, thereby leading to a decrease in software availability. Ultimately, this lack of an effective protection system may result in the reduction of computers' usefulness.

Another method of protecting computer software may be under unfair competition law. This method may effectively regulate the misappropriation of computer programs by third parties. However, this method would not develop the notion that computer programs are the proper objects of intellectual property. Unfair competition law is not designed to protect “property” but, rather, to regulate competition. As a consequence, unfair competition law does not provide the adequate standards for governing ownership transfer and license of rights. Although it is possible to set forth such standards in unfair competition law, provided such standards are enunciated, the law would then no longer be an “unfair competition law” but instead a form of sui-generic intellectual property law.

In view of the above, two viable alternatives for a harmonized international legal system remain. They are copyright protection and sui-generic protection.

115. For broadening the scope of contractual protection, so-called “shrink-wrap” licensing agreements have been widely used recently. The term “shrink-wrap” refers to the clear plastic wrapping that seals the software box and through which buyers can read the license agreement. “[The shrink-wrap] agreements offer to the ‘purchaser’ a license to use the software, which the ‘purchaser’ legally accepts when he tears open the shrink-wrap.” See Note, The Enforceability of State “Shrink-Wrap” License Statutes in Light of Vault Corp. v. Quaid Software, Ltd., 74 CORNELL L. REV. 222, 223 (1988).
C. SUITABILITY OF COPYRIGHT PROTECTION

As described in the preceding sections, significant differences between computer programs and conventional literary works exist. Based on these differences, the major arguments against copyright protection may be summarized as follows:

(i) Computer programs are hardly "literary," "scientific" or artistic" works. Instead, they are considered utilitarian works;
(ii) The unique nature of computer programs makes copyright protection unavailable; and,
(iii) Copyright protection is inappropriate because of the duration of protection and other features of copyright law which are unsuitable for computer programs.116

Recognition of the distinctive nature of computer programs is vital. As described above, computer programs are not intended as a medium of communication between human beings. They involve various interrelated "expressions," namely "expression" in source-code format, "expression" in object-code format, "layout-design" of a ROM chip and audiovisual or pictorial displays. More specifically, source-code programs are designed to be translated into object-code programs; object-code programs, which may be embedded in a ROM chip, are designed to generate audiovisual or pictorial displays. Compared with traditional literary works, computer programs have quite complex dimensions. In addition, unlike traditional literary works, a computer program, rarely, if ever, intends to represent one's idea. The sole purpose of a computer program is to help operate a computer, a purpose unique to computer programs. These differences, however, do not necessarily lead one to conclude that computer programs are outside the scope of copyright law. It is still possible to "extend" the scope of copyright protection to computer programs, based on the computer programs' affinity with traditional copyrightable works. The decisive issue is not the interpretation of the notion of "literary," "scientific," "artistic" or "utilitarian," but the evaluation of the suitability for software protection.

On the other hand, it is possible to deny copyright protection and, instead, establish *sui-generis* protection of computer software as WIPO

116. At the first session of the Committee of Experts on Model Provisions for Legislation in the Field of Copyright, the following main arguments were formulated against copyright protection of computer programs:

Computer programs are not covered by the Berne Convention; they are of a technical and utilitarian character and cannot be considered to belong to the literary and artistic domain. In general, they lack originality and are composed of mere subroutine elements. Copyright protection's basic provisions do not suit the protection of computer programs; for example, the 50-year term of protection after the author's death is unrealistic; computer programs become obsolete within a much shorter period.

Note, supra note 86, at 148.
and MITI once attempted. In light of computer programs' distinctive character, it might seem more plausible to select this alternative. *Sui-generis* protection may furnish ideal substantive standards for software protection. The fatal flaw of this scheme is that, before introducing new legislation, one could not assure adequate protection of computer programs. Copyright protection can be provided based on the existing copyright law, while *sui-generis* protection cannot be given before its enactment. Since they were invoked to provide immediate protection, the courts could not afford to wait for such new legislation. The only alternative was to adopt copyright protection.

Thus, the key issues are: (i) whether or not copyright protection fits the need; and (ii) whether or not the adoption of copyright protection causes harmful side effects, i.e., "the danger of corrupting and eroding longstanding copyright principles." 117

Copyright law shall not permit the author of a copyrightable work to be given the exclusive right to the "idea" underlying the expression of the work. Competitors may exploit the idea to create their own works. This principle seems suitable for software protection. Copyright law may enable resources to be properly allocated without diminishing the incentive to create original computer programs. First, because the author can still enjoy the copyright on the expression of his computer program, copyright law may not be harmful to the incentive for creation. Second, if the author of a popular program is not able to satisfy the demand for his program, competitors' programs may be substituted.

As argued, copyright is not an ideal tool to regulate the conflicting interests between the author of the original program and other competitors. The duration of protection is certainly too long. Some further adjustments to the copyright principle may be required, such as rental rights and moral rights. Since computer programs are so easy to be copied compared with traditional literal works, special consideration needs to be given upon the renting of computer programs. In addition, moral rights, which include the author's right to object to any modification of the work, might be adjusted in order to satisfy the users' need to modify the program. Nevertheless, provided there is an adequate scope of protection, copyright protection of computer programs seems effective and useful. Thus, we should strive to develop an international copyright protection system for software. If we correctly realize the distinctive nature of computer programs, applying copyright law to computer programs shall not pose "the danger of corrupting and eroding longstanding copyright principles." 118

117. Friedman, supra note 4, at 18.
118. Id.
V. CONCLUSION: THE NEED TO ESTABLISH AN INTERNATIONAL PROTECTION SYSTEM

"The need for the law to respond to new developments in technology has been a recurring program throughout history."119 In particular, the revolutionary development of computer technology seems hard to follow for both lawmakers and judicial circles. At the international level, the problem is even more complex. The remarkable imbalance of technology—i.e., the conflicting interests of developed and developing countries—has hampered the formulation of an international legal system for the protection of computer programs. Even though progress seems too slow and national trade laws such as the Omnibus Trade and Competitiveness Act of 1988 appear to be an effective way out of this difficulty, we should not rely on such dangerous immediate tactics. In the end, what will produce fruitful results will be sincere multinational discussions which require enormous time and patience and, hopefully, result in a harmonized international protection system.

Exhibit A  Basic Structure of a Computer

Central Processing Unit ("CPU")
- Control Unit
- Arithmetic/Logic Unit
- Registers

Primary Memory
- RAM
- ROM

Photolithography
(Layout-design)

Object-Code
Source-Code

Operating System Programs
Application Programs

Computer Programs
- Supporting Materials
- Program Description

Input/output processor
- Keyboard
- CRT
- Printer
- Secondary Memory
  - Hard Disks
  - Floppy Disks
  - Tapes, Etc.

Audiovisual Display

Object-Code
Source-Code
### Exhibit B  History of Computer Software Protection

<table>
<thead>
<tr>
<th>Year</th>
<th>International Level</th>
<th>U.S.A.</th>
<th>Backgrounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1964</td>
<td>The Register of Copyright first accepted software for registration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1969</td>
<td>UN requested WIPO to pursue study on software protection.</td>
<td></td>
<td>IBM announced unbundling.</td>
</tr>
<tr>
<td>1970</td>
<td>UN requested WIPO to pursue study on software protection.</td>
<td></td>
<td>Intel invented the first microprocessor.</td>
</tr>
<tr>
<td>1971</td>
<td>UN requested WIPO to pursue study on software protection.</td>
<td></td>
<td>In Philippines, copyright protection was adopted.</td>
</tr>
<tr>
<td>1979</td>
<td>Expert Group on the Legal Protection of Computer Software</td>
<td>CONTU Final Report</td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td></td>
<td>Copyright Law Amendment</td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>William Electronics v. Artic</td>
<td>MITI Proposal</td>
<td></td>
</tr>
<tr>
<td>1983</td>
<td>Committee of Experts on the Legal Protection of Computer Software</td>
<td>Apple Computer v. Franklin</td>
<td>In Hungary, copyright protection was adopted.</td>
</tr>
<tr>
<td>1984</td>
<td></td>
<td>Semiconductor Chip Protection Act</td>
<td>Copyright Law Amendment in India and Australia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Apple Computer v. Formula</td>
<td></td>
</tr>
</tbody>
</table>
1991] INTERNATIONAL PROTECTION

International Level  U.S.A.  Backgrounds

1985  Group of Experts on the Copyright Aspects of the Protection of Computer Software

Extraordinary Executive Committee of Berne Union

1986  Whelan v. Jaslaw  Copyright protection was adopted in Dominican Republic.
     NEC v. Intel
     Broderbund Software v. Unison

1987  Extraordinary Executive Committee of Berne Union

1988  Committee of Governmental Experts on the Evaluation and Synthesis of Principles on Various Categories of Works

"Special" Section 301 of the Omnibus Trade and Competitive Act

Mid-term review of the Uruguay round

1989  Committee of Experts on Model Provisions for Legislation in the Field of Copyright

Copyright protection was adopted in Denmark, Sweden and Israel

Diplomatic Conference for the Conclusion of a Treaty on the Protection of Intellectual Property in respect of Integrated Circuits

1990  Lotus v. Paperback Software