The Know-How Gap in the TRIPS Agreement: Why Software Fared Badly, and What Are the Solutions*

by

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Introduction

The notion that intellectual property rights, historically grounded in territorial law, might, in our lifetimes, become converted into universal norms binding on some 125 states seemed like a pipe dream in the 1980s. Yet, the Final Act of the recently concluded Multilateral Trade Negotiations, known as the Uruguay Round, has transformed this dream into reality. These negotiations have integrated the General Agreement on Tariffs and Trade (GATT) into the much broader and stronger legal framework of the Marrakesh Agreement Establishing the World Trade Organization (WTO Agreement). Annex 1C of this document, known as the Agreement on Trade Related Aspects


2. Cf. Jonathan I. Charney, Universal International Law, 87 Am. J. Int’l L. 529, 543-50 (1993) (stressing the “central role” of multilateral forums “in the creation and shaping of contemporary international law” and the ability of these forums to “move the solutions substantially towards acquiring the status of international law”).


6. The word “treaty” is not used in any of the relevant documents and the official view apparently regards United States acceptance as an Executive Agreement, not subject to approval by a two-thirds vote of the Senate. See, e.g., The Uruguay Round Agreements Act—Statement of Administrative Action, in MESSAGE FROM THE PRESIDENT OF THE UNITED STATES, H.R. Doc. 103-316, 103d Cong., 2d Sess., at 656, 667-70 (1994) (noting need for “Congressional approval” of the Uruguay Round agreements and for authorization of President to accept them, and stressing that “no provision of a Uruguay Round agreement will be given effect under domestic law if it is inconsistent with federal law” as enacted or amended by Congress). Congress has accordingly implemented its view of the mandatory obligations flowing from the WTO Agreement. See Uruguay Round Agree-
of Intellectual Property Rights (TRIPS Agreement),\(^7\) establishes a comprehensive set of international minimum standards of intellectual property protection that all WTO member states must respect in their domestic laws.\(^8\) The TRIPS Agreement also requires all member states to maintain adequate levels of judicial and administrative enforcement,\(^9\) and it provides dispute-resolution machinery that can lead to cross-sectoral trade sanctions.\(^10\)

In evaluating developments of such capital importance, I contend that both the strengths and weaknesses of the TRIPS Agreement stem from its essentially backwards-looking character. A source of strength is that TRIPS builds firmly on the Paris Convention for the Protection of Industrial Property (1883) and on the Berne Convention for the Protection of Literary and Artistic Works (1886).\(^11\) In this respect, it embodies mostly time-tested legal norms that gained acceptance in

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\(^7\) WTO Agreement, supra note 5, Annex 1C, Agreement on Trade-Related Aspects of Intellectual Property Rights, in Final Texts of Uruguay Round, supra note 3, at 319-52 [hereinafter TRIPS Agreement].


\(^10\) TRIPS Agreement, supra note 7, arts. 63-66; WTO Agreement, supra note 5, Annex 2, Understanding on Rules and Procedures Governing the Settlement of Disputes, in Final Texts of Uruguay Round, supra note 3, at 353-78 [hereinafter Understanding on Disputes]. See also Universal Minimum Standards, supra note 8, at 347, 385-88; Robert E. Hudec, Dispute Settlement, in Completing the Uruguay Round—A Results-Oriented Approach to the GATT Trade Negotiations 180-204 (Jeffrey J. Schott ed., 1990). For changes in United States trade law occasioned by these provisions (which may or may not conform to their requirements), see URAA, supra note 6, §§ 121-130.

developed legal systems. Its principal weakness, however, stems from the drafters' technical inability and political reluctance to address the problems facing innovators and investors at work on important new technologies in an Age of Information. The drafters' decision to stuff these new technologies into the overworked and increasingly obsolete patent and copyright paradigms simply ignores the systemic contradictions and economic disutilities this same approach was already generating in the domestic intellectual property systems.

The treatment of computer software under the TRIPS Agreement exemplifies these strengths and weaknesses. To demonstrate the deeper implications of its flawed solution, this Article will draw on core findings of several recently published monographs in which my co-authors and I identify the real problems troubling the legal protection of new technologies that fit imperfectly within the classical patent and copyright molds. This Article, like those monographs, ends by affirming the need for a new intellectual property paradigm, built on modified liability principles, that would stimulate investment in sub-


13. See, e.g., J.H. Reichman, Legal Hybrids Between the Patent and Copyright Paradigms, 94 Colum. L. Rev. 2432, 2448-504 (1994) [hereinafter Legal Hybrids]; Pamela Samuelson, Randall Davis, Mitchell D. Kapor & J.H. Reichman, A Manifesto Concerning the Legal Protection of Computer Programs, 94 Colum. L. Rev. 2308, 2332-65 (1994) [hereinafter Samuelson et al., Manifesto]. Pamela Samuelson is a Professor of Law at the University of Pittsburgh; Randall Davis is a Professor of Computer Science and Associate Director of the Artificial Intelligence Laboratory at the Massachusetts Institute of Technology; Mitchell D. Kapor, who founded Lotus Development Corp. and designed Lotus 1-2-3, is Chairman of the Board of the Electronic Frontier Foundation.

patentable innovation without creating the anti-competitive effects characteristic of existing regimes.  

I
Impact of the TRIPS Agreement on the Legal Protection of Computer Programs

Prior to the TRIPS Agreement, the status of computer program-related patents in international intellectual property law was undefined, while the international status of software copyrights had become controversial. The following discussion suggests that the TRIPS Agreement ignores software patents as such, which means that program-related inventions are left largely to the discretion of domestic laws. At the same time, states that do issue such patents will have to satisfy the international minimum standards set out in the TRIPS Agreement, and they may not discriminate against the nationals of other WTO states that do not issue similar patents for valid technical reasons. In contrast, the TRIPS Agreement brought unpatentable computer programs squarely within the international copyright system founded on the Berne Convention. However, it failed to clarify the scope-of-protection issues that have so far limited the effectiveness of copyright protection for computer software in the domestic laws.

A. Computer Program-Related Inventions

Historically, the developed countries, especially the United States, were reluctant to patent computer program-related inventions at all. The European Patent Convention is still couched in terms


16. See, e.g., BRIDGET CZARNOTA & ROBERT J. HART, LEGAL PROTECTION OF COMPUTER PROGRAMS IN EUROPE—A GUIDE TO THE E.C. DIRECTIVE 95-97 (Butterworths 1991) [hereinafter CZARNOTA & HART] (recognizing availability of patent protection “not for computer programs as such, but for inventions of technical effect embodied in computer programs,” as per the relevant dispositions of the domestic patent offices and the European Patent Office); W.R. Cornish, Computer Program Copyright and the Berne Convention, in A HANDBOOK OF EUROPEAN SOFTWARE LAW 183, 183-86 (M. Lehmann & C.F. Tapper eds., 1993); infra note 18 and accompanying text.

that tend to discourage the issuance of such patents. In practice, however, the patent offices of the United States, Japan, and even the European Union countries have increasingly granted patents covering industrial applications of computer programs that produce specified technical effects while claiming that algorithms as such remain ineligible. This practice seems likely to grow, in part because of inherent limits on copyright protection such as those that the United States federal appellate courts have recently discovered, and in part because, in a more mature software industry, producers may need higher levels of technical achievement than in the past to penetrate crowded market segments.

To the extent that some states allowed the patenting of program-related inventions in the past, the Paris Convention required member countries to observe its characteristic rules of national treatment and priority. Equally characteristic of the Paris Convention, however, was its silence regarding such fundamental issues as mandatory subjects of patentability, criteria of eligibility, scope of protection, and duration. The lack of international minimum standards pertaining to such basic issues of international patent protection explains why the developed countries needed a more comprehensive agreement in the first place.

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20. See infra notes 100-103 and accompanying text.
22. Paris Convention, supra note 11, arts. 2(1), 4A(1). The TRIPS Agreement mandates compliance with both rules, whether or not a WTO member country belongs to the Paris Union. TRIPS Agreement, supra note 7, art. 2(1).
The TRIPS Agreement fills these gaps by obliging WTO member states to make “[p]atents . . . available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step [i.e., nonobviousness], and are capable of industrial application.”24 Moreover, the same article requires patents to be “[a]vailable and patent rights enjoyable without discrimination as to the place of invention, the field of technology and whether products are imported or locally produced.”25 While a short list of exemptions allows states to exclude from patentability such categories as medical treatments, plants and certain other life forms, and inventions dangerous to health or the environment,26 it makes no mention of computer programs.

It follows that no WTO member state could deny patent protection to all computer program-related inventions as such without allowing inventors the possibility of showing that some particular program-related inventions, as determined by reasonably applied criteria recognized by mature legal systems, met the overall minimum standards of eligibility specified above.27 This makes sense because, disregarding considerations of practicality, electrical engineers could, in principle, express most software designs in cumbersome but functionally equivalent hardware designs.28 To deny these designs access to international patent protection as a class would violate the express prohibition against field specific exclusions from eligibility.

At this point, however, the failure of the TRIPS Agreement to mention software patents, or otherwise to deal with the difficulties this subject matter has engendered, becomes a two-edged sword because it provides no statutory basis for overcoming the formidable doctrinal obstacles to patentability that prevail in most developed legal systems.29 On the contrary, a WTO dispute-settlement panel30 charged

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24. TRIPS Agreement, supra note 7, art. 27(1) & n.5 (emphasis supplied).
25. Id. (emphasis supplied). This clause recognizes the possibility for developing countries to delay implementation under art. 65(4) and their need to respect the pipeline provisions of art. 70(8). See also Universal Minimum Standards, supra note 8, at 351-66.
26. TRIPS Agreement, supra note 7, arts. 27(2), (3).
27. See, e.g., id. arts. 62(1) (granting of rights to be conditioned on “reasonable procedures and formalities”), 63(1) (requiring transparency with regard to laws and regulations, final judicial decisions, and administrative rulings), 64(1) (discussing dispute settlement procedures), 68 (Council for TRIPS to monitor members’ compliance with their obligations).
28. See, e.g., Samuelson et al., Manifesto, supra note 13, at 2319 (citing authorities).
29. See supra note 17; infra notes 32-36 and accompanying text.
30. See generally TRIPS Agreement, supra note 7, arts. 63-66. See also supra note 10 and accompanying text.
with investigating complaints that certain states did not adequately recognize program-related patents would logically have to take these restrictive state practices into account.\textsuperscript{31} Such a panel would, accordingly, have to consider judicial exclusions pertaining to laws of nature and naturally occurring phenomena; to scientific principles or mathematical formulas; to abstract ideas, such as methods for doing business; to mental processes as such; and, in the European Union, to "presentations of information."\textsuperscript{32} It would further have to evaluate the complex doctrinal tools that courts in different countries use to distinguish claims that recite statutory subject matter from those that merely contain algorithms or other unprotectable subject matter.\textsuperscript{33}

\textsuperscript{31} See, e.g., Treaty Establishing the International Court of Justice, (I.C.J.) art. 38(b); Restatement (Third) of Foreign Relations Law § 903 (1987).

\textsuperscript{32} See, e.g., Diamond v. Diehr, 450 U.S. 175, 185 (1981); In re Alappat, 33 F.3d 1526, 1542-43 (Fed. Cir. 1994); EPC, supra note 18, art. 52(2)(d); Hanneman, supra note 17, at 70-79. See also USPTO, Guidelines for Examination of Computer-Implemented Inventions, 60 Fed. Reg. 28, 77 (1995) (proposed June 2, 1995) [hereinafter USPTO Proposed Guidelines].

\textsuperscript{33} See, e.g., Laurie, supra note 17, at 96-101. In the past, for example, the United States Patent and Trademark Office issued patents for computer program-related inventions that were described either as a series of functional steps carried out by a computer (i.e., as a process) or as a system capable of performing certain functions (i.e., as an apparatus), but not for program code as such. See, e.g., Arrhythmia Research Technology, Inc. v. Corazonix Corp., 958 F.2d 1053, 1058 (Fed. Cir. 1992) (holding that claims to a specified process or apparatus implemented in accordance with a mathematical algorithm will generally satisfy the patent statute). In either case, United States courts formally treated the subject matter as statutory only if a claimed invention consists of a so-called "non-statutory mathematical algorithm" as defined in complicated legal tests that aim to exclude scientific principles, abstract ideas, and mathematical formulas or discoveries. See, e.g., In re Grams, 888 F.2d 835 (Fed. Cir. 1989); In re Iwahashi, 888 F.2d 1370 (Fed. Cir. 1989). In the presence of a mathematical algorithm, courts used these tests to determine if it had been sufficiently applied to a utilitarian objective, as when a computer was used as part of a process or apparatus for the transformation of a physical substance into a different state. See, e.g., In re Alappat, 33 F.3d at 1543-45 (stating that the "fact that the four claimed means elements function to transform one set of data to another through what may be viewed as a series of mathematical calculations" did not preclude claim as a whole from reciting patentable machine, on theory that "general purpose computer in effect becomes a special purpose computer once it is programmed to perform particular functions pursuant to instructions from program software"). Recent cases and proposed guidelines have applied these principles in a more relaxed and inclusive manner that lowers the subject-matter barrier. See infra note 36 and accompanying text; see also Richard H. Stern, Tales from the Algorithm War: Benson to Iwahashi, It's Deja Vu All Over Again, 18 AIPLA Q.J. 371 (1991); David S. Benyacar, Mathematical Algorithm Patentability: Understanding the Confusion, 19 Rutgers Computer & Tech. L.J. 129 (1993); Alan P. Klein, Reinventing the Examination Process for Patent Applications Covering Software-Related Inventions, 13 J. Marshall J. Computer & Info. L. 231 (1995). For the practice abroad, which aims at similar discriminations, but sometimes employs different tests, see, e.g., Hanneman, supra note 17, at 85 (noting that U.S. and Japanese patent offices were less restrictive in allowing computer-related inventions than the European Patent Office); Kolle, supra note 19, at 663-69.
nally, an investigative panel might have to consider state practice concerning application of the international nonobviousness standard\(^{34}\) to the program-related inventions under review, which would immerse it in one of the thorniest and most controversial issues of them all.\(^ {35}\)

One must concede that the United States Court of Appeals for the Federal Circuit has relaxed the subject-matter barriers to patentability in a series of recent cases.\(^ {36}\) However, neither that court, nor the Supreme Court should it endorse this trend, possess the authority to set standards for the rest of the world. Second-guessing the decisions of domestic courts and administrators in these matters without any consensually evolved international guidelines would only exacerbate the policy tensions surrounding software patents in general.\(^ {37}\)

In the meanwhile, if World Trade Organization (WTO) panels were to delve into these matters in contentious cases, it would augment the member states’ risk that the WTO’s dispute-settlement machinery might end up resolving complex intellectual policy issues of major domestic concern at the expense of domestic legislatures. This prospect has already intrigued at least one leading commentator.\(^ {38}\) Given the current lack of consensus concerning software-related patents and the overall preference for copyright protection of computer

\(^{34}\) See TRIPS Agreement, supra note 7, art. 27(1) & n.5 (equating “inventive step” with “non-obviousness”). It is not clear that, under the best of circumstances, efforts to eliminate cultural and policy differences that lead different countries (or sometimes the same country at different times) to expand or contract the nonobviousness standard will prove susceptible to harmonization at the international level. Cf. Harold C. Wegner, Patent Harmonization—by Treaty or Domestic Reform 84-86 (1990) (stating that the “intricacies of the test of obviousness in each country are too much to iron out among even the most skilled scholars and experts”).

\(^{35}\) See, e.g., Samuelson et al., Manifesto, supra note 13, at 2346. Scope of protection issues are equally daunting. See, e.g., id. at 2345; Brian Kahin, The Software Patent Crisis, TECH. REV., Apr. 1990, at 53, 58 (problem of overbroad software patents).

\(^{36}\) See In re Trovato, 60 F.3d 807 (Fed. Cir. 1995), vacating In re Trovato, 42 F.3d 1376 (Fed. Cir. 1994); In re Beauregard, 53 F.3d 1583 (Fed. Cir. 1995); In re Alappat, 33 F.3d 1526 (Fed. Cir. 1994). See also In re Warmerdam, 33 F.3d 1354 (Fed. Cir. 1994); In re Lowry, 32 F.3d 1579 (Fed. Cir. 1994); USPTO Proposed Guidelines, supra note 32.

\(^{37}\) For example, in a major decision concerning the eligibility of a computer-program related invention, the United States Court of Appeals for the Federal Circuit, sitting en banc, produced five different opinions, three of which found at least six of the judges in varying degrees of dissent. See In re Alappat, 33 F.3d 1526 (Fed. Cir. 1994). For the intractability of these views, compare the majority opinion, id. at 1543-45 (quoted supra note 33) with id. at 1545, 1564-65 (Archer, C.J., dissenting) (finding that the claimed invention, held statutory by the majority, “is simply the mathematical conversion of data,” and that the claims merely recite “newly discovered mathematics and not the invention . . . of a process or product applying it”). For the larger policy tensions surrounding the patenting of computer programs in general, see Samuelson et al., Manifesto, supra note 13, at 2343-47.

programs expressed in the TRIPS Agreement itself, disinterested triers of fact could hardly fault WTO states that denied patent protection to most computer programs, provided the relevant courts and administrators avoided the appearance of arbitrary or capricious decision-making.

To the extent that some states do make computer program-related patents available to nationals for reasons of their own, they must allow nationals of other member states to obtain them without discrimination. All of these patentees become entitled to reap the benefits of the TRIPS Agreement, except in their respective countries of origin. For example, foreign patentees must be allowed to exercise all the exclusive rights stipulated in the Agreement, including the exclusive right to import the patented program for a period of at least twenty years from the filing date. Although WTO Member states may no longer impose forfeiture for failure to work such patents locally, foreign patentees do remain liable to compulsory licensing on various grounds, including grounds of "abuse" if an appropriate judicial or administrative body finds that the patentee has charged unreasonably high prices. On the whole, the conditions governing the issuance of compulsory licenses became more favorable to foreign patentees than in the past.

The national treatment and Most-Favored-Nation (MFN) clauses of the TRIPS Agreement impose a firm obligation on states granting program-related patents to open their markets to similarly qualified foreign software inventions whether or not patentable in the inventors' home countries and without obtaining any reciprocal degree of patent protection for their own software inventions from countries

39. See TRIPS Agreement, supra note 7, art. 10; infra text accompanying notes 63-64.
40. See supra note 27; see also TRIPS Agreement, supra note 7, art. 41(2) (stating that "procedures concerning the enforcement of intellectual property rights shall be fair and equitable").
41. See TRIPS Agreement, supra note 7, arts. 1(3) (stating that "Members shall accord the treatment provided for in this Agreement to the nationals of other Members"), 2(1) (mandating compliance with Paris Convention, arts. 1-3), 4 (concerning Most-Favored-Nation (MFN) Treatment).
42. See TRIPS Agreement, supra note 7, art. 28.
43. See id. art. 33; see also URAA, supra note 6, §§ 532-533 (amending 35 U.S.C. sections 154, 271 (1988) to extend duration of patents from 17 to 20 years from date of application and to clarify that unauthorized imports and offers to sell constitute infringement).
44. Compare TRIPS Agreement, supra note 7, art. 27(1) (stating that patent rights shall be "[e]njoyable without discrimination as to . . . whether products are imported or locally produced") and id. art. 28(1) (recognizing exclusive right to import patented product or product made from patented process) with Paris Convention, supra note 11, art. 5A.
45. See TRIPS Agreement, supra note 7, arts. 31, 40.
46. See id. art. 31; see generally Universal Minimum Standards, supra note 8, 355-57.
that do not readily issue patents on similar inventions.\textsuperscript{47} This asymmetry means that both developed and developing countries remain free to determine the level of patent protection afforded computer program-related inventions within their respective jurisdictions but not free to impose their domestic policies on other member countries.

As a result, developed countries that increasingly issue patents on computer programs could exclude infringing imports from developing countries. But the former “could not prevent firms in developing countries from ignoring these same patents at home or from exporting competing products that did not violate copyright, trademark and trade secret laws to third-country markets where such patents were not given effect.”\textsuperscript{48}

Over time, of course, state practice may evolve to the point where patent protection of program-related inventions becomes more widespread and uniform in character. Ongoing trade policy review exercises, established by the TRIPS Agreement,\textsuperscript{49} could then logically embrace this topic, and dispute-settlement panels might take greater judicial notice of an emerging consensus.\textsuperscript{50} This very evolution, however, might alarm many developing countries that managed to acquire capacity in computer technology,\textsuperscript{51} and it would fuel earlier fears that foreign software patents could condemn them to a chronically dependent role as cheap suppliers of software services and little else.\textsuperscript{52} To overcome the developing countries’ reluctance to recognize a consensus favoring broader international patent protection of computer programs (should such a consensus arise) states favoring stronger protection would probably need to offer offsetting trade concessions of interest to those countries.\textsuperscript{53}

\textsuperscript{47} See infra note 41.
\textsuperscript{48} TRIPS Component, supra note 8, at 202.
\textsuperscript{49} See TRIPS Agreement, supra note 7, art. 71.
\textsuperscript{50} See, e.g., Geller, supra note 38, at 107-14.
\textsuperscript{52} See TRIPS Component, supra note 8, at 200-01 (citing authorities).
\textsuperscript{53} See, e.g., Universal Minimum Standards, supra note 8, at 383 (“Compensation as the Key to Future Concessions”); Maskus & Konan, supra note 23, at 412.
B. Copyright Protection of Computer Software

Prior to the TRIPS Agreement, the United States argued unsuccessfully that computer programs fell within the Berne Convention,\(^{54}\) which champions "the protection of the rights of authors in their literary and artistic works," and which broadly defines such works to "include every production in the literary, scientific and artistic domain, whatever may be the mode or form of its expression . . ."\(^{55}\) This "unity of literature" thesis espoused by the United States since 1980,\(^{56}\) however, ignored the dual function of computer programs, a phenomenon that Professor Randall Davis captured when he stated that a computer program "is a machine whose medium of construction happens to be text."\(^{57}\) Other leading industrialized countries that emphasized the dual nature of computer software did not initially subscribe to the full copyright approach.

For example, the French copyright law of 1985\(^{58}\) effectively treated computer programs in much the same way that the Berne Convention allows states to treat "works of applied art"\(^{59}\) under a regime built on modified copyright principles.\(^{60}\) In Germany, despite

\(^{54}\) See, e.g., Michael S. Kepplinger, Authorship in the Information Age: Protection for Computer Programs Under the Berne and Universal Copyright Conventions, 21 COPYRIGHT (W.I.P.O.) 119 (1985). But see S.J. Soltyshinski, Protection of Computer Programs: Comparative and International Aspects, 21 INT’L REV. INDUS. PROP. & COPYRIGHT L. 1 (1990) (denying that Berne Convention required protection of software); Cornish, supra note 16, at 185 (stating that there “was no basis for insisting that member states treat programs as literary works within either the Berne or Universal Copyright Conventions”).

\(^{55}\) Berne Convention, supra note 11, arts. 1, 2(1).

\(^{56}\) The “unity of literature” doctrine, which posits full copyright protection for computer programs, contrasts with the “unity of art” doctrine in France, which posits full copyright protection of industrial designs. Paradoxically, the United States has historically opposed the “unity of art” doctrine in France, and France recently opposed the “unity of literature” approach in the United States. See, e.g., Legal Hybrids, supra note 13, at 2483-88 (“Limits of the ‘Unity of Literature’ Approach”).


\(^{59}\) See Berne Convention, supra note 11, arts. 2(7), 7(4).

legislative recognition of computer programs as copyrightable subject matter, the High Court disentitled routine programs from such protection by imposing strict standards of eligibility like those it had previously used to limit copyright protection of industrial art. The German High Court relegated the bulk of these same programs to unfair competition law, with a hint that this law could impede slavish duplication.61 Because state practice in these and other countries revealed a lack of consensus, it was not clear that states disinclined to protect computer programs at all were subject to any countervailing obligations under international law.62

1. Eligibility, Duration, and “TRIPS Treatment”

The TRIPS Agreement weighed into this controversy by proclaiming that “[c]omputer programs, whether in source or object code, shall be protected as literary works under the Berne Convention (1971).”63 All WTO member states must, therefore, confer copyright protection on some computer programs, just as Berne Union countries had to confer copyright protection on some “works of applied art” after this subject-matter category entered the Berne Convention in 1948.64 The TRIPS Agreement, however, says nothing about the eligibility criteria that states must apply to this controversial subject matter; nor, apart from a generalized exclusion of “ideas, procedures, methods of operation or mathematical concepts as such,” which applies to all literary and artistic works in general,65 does the Agreement concern itself with scope of protection or other issues that have taxed domestic courts. Hence, just as WTO member states remain free to apply their own criteria for distinguishing between copyrightable works of applied art and noncopyrightable industrial designs,66 they might argue that the decision to treat computer programs “as literary

62. See supra note 54. States unwilling to protect foreign software might even have argued that foreign software producers were not entitled to national treatment under domestic laws, on the grounds that software fell outside the Berne Convention. Cf., e.g., Cornish, supra note 16, at 185 (stressing the fact that computer programs were not named as subject matter covered by international conventions).
63. TRIPS Agreement, supra note 7, art. 10(1).
65. See TRIPS Agreement, supra note 7, art. 9(2).
66. See, e.g., Designs Before 1976, supra note 64, at 1166-70.
works” did not preclude them from modifying general principles of copyright law not addressed in the TRIPS Agreement to limit the protection of computer programs as “applied literature.”

To be sure, the European Community’s Council Directive on Computer Programs will override inconsistent provisions of the domestic laws, which should vitiate both the eligibility standards under prior German law and some of the sui generis dispositions of the French law. However, the European Directive imposes tailor-made limitations of its own that deviate from the classical copyright paradigm of the past, while the Japanese copyright provisions concerning software—adopted under strenuous pressures from the United States—may turn out to be quir kier than they appear on the surface. The point is that, even disregarding the crucial scope of protection issues discussed below, the treatment of computer programs “as literary works” under the TRIPS Agreement will turn largely on state practice for the foreseeable future, and not on treaty law. States that are not afraid to “tweak the giants’ beards” might, therefore, plausibly introduce measures, for example, to restrict eligibility, like those that leading developed countries have employed against disfavored subject-matter categories in the past. Recalcitrant states could not, however, limit the duration of protection on analogy to works of ap-

67. In actual practice, no state or group of states has simply applied the mature copyright paradigm to computer programs without tailor-made adjustments of considerable significance. See Universal Minimum Standards, supra note 8, at 371 n.196-98 (citing authorities). But see André Kevere, Le GATT et le droit d’auteur international, 47 Revue Trimestrielle de Droit Commercial 629, 634-35 (1994) (rejecting “applied literature” approach).


72. See supra text accompanying notes 64-67.
plied art, as they might have done before the TRIPS Agreement. This follows because Article 12 of that Agreement expressly imposes minimum terms of protection for all classes of works, except photographic works and works of applied art.

Because computer software now qualifies for protection under the TRIPS Agreement, and that Agreement builds on the Berne Convention, even producers who are hampered by unorthodox eligibility requirements at home should obtain national treatment abroad, without regard to any lack of reciprocity. All foreign producers (as distinct from nationals in the countries of origin) should also benefit automatically from the formidable array of international minimum standards that the TRIPS Agreement confers. For example, foreign copyright proprietors should obtain the exclusive rights specified in the Berne Convention, the rental rights conferred on computer programs under the TRIPS Agreement, and the guaranteed minimum term of protection as specified in both of these documents. In addition, rights holders benefit from all the enforcement measures that the TRIPS Agreement mandates, including the right to obtain preliminary injunctions and the right to exclude the importation of “coun-

73. See supra notes 59, 66 and accompanying text.
74. TRIPS Agreement, supra note 7, art. 12 (requiring minimum 50-year term of protection when life of natural person is not the basis of duration, except for photographic works and applied art).
75. See TRIPS Agreement, supra note 7, art. 9(1); supra note 11 and accompanying text.
76. See Berne Convention, supra note 11, art. 5(1); TRIPS Agreement, supra note 7, arts. 1(3), 3, 4.
77. See TRIPS Agreement, supra note 7, arts. 1(3), 3(1); Berne Convention, supra note 11, art. 5(1)(3) (“Protection in the country of origin is governed by domestic law”); id. art. 5(4) (criteria for determining the country of origin). In principle, WTO countries may continue to discriminate against national copyright owners, unless domestic law otherwise specifies.
78. See Berne Convention, supra note 11, arts. 8-14ter.
79. See TRIPS Agreement, supra note 7, art. 14.
80. See supra note 74. In the United States, nationals of other WTO countries may also benefit from provisions in the Berne Convention that prevent technical forfeitures of copyrighted works whose terms of protection had not expired at the time this country joined the Union. See Berne Convention, supra note 11, art. 18; TRIPS Agreement, supra note 7, art. 70(2)(3); URRAA, supra note 6, § 514, amending 17 U.S.C. § 104(A) (1988) (restoring rights of foreign copyright owners, including producers of sound recordings, who technically forfeited their copyrights under specified conditions of prior U.S. law).
81. See TRIPS Agreement, supra note 7, arts. 41-61. Article 41 states in part: Members shall ensure that enforcement procedures as specified in this Part are available under their law so as to permit effective action against any act of infringement . . . including expeditious remedies to prevent infringements and remedies which constitute a deterrent to further infringements.
Id. art. 41.
82. See id. art. 50.
terfeit trademark” or “pirated copyright goods.” Their national trade representatives may also resort to dispute-settlement procedures to combat lax enforcement in recalcitrant states.

This potent battery of rights and remedies will greatly benefit software exporters seeking to repress the sales of cheaply made, literal or wholesale copies of their copyrighted programs in the worldwide marketplace envisioned by the Uruguay Round. To be sure, the TRIPS Agreement might have achieved a comparable result by forbidding slavish imitation of computer programs for a fixed period under Article 10bis of the Paris Convention, and the failure to take this route, or some other alternative, may have undermined the historical mission and economic functions of the mature copyright paradigm. Nevertheless, the end results—by whatever means—provide a much more workable and effective legal framework for combatting copycat duplicators than ever before.

Consider, for example, that if China were a member of the WTO, United States pressures to stop the duplication of its nationals’ copyrighted computer programs could be exerted against China within a multilateral framework. The practices tolerated by the Chinese government would, moreover, violate specific international minimum standards, and all the mediatory and dispute-settlement procedures of the WTO Agreement would become available, including cross retaliatory sanctions. In other words, the same pressures in that context would avoid the taint of unilateral interference in the internal affairs of another sovereign state that had not expressly recognized the norms on which the complaining state relied as binding internation-

83. See id. arts. 51-60 (“Special Requirements Related to Border Control Measures”). For this purpose, “counterfeit trademark goods” are defined as “goods, including packag- ing, bearing without authorization a trademark which is identical to the trademark validly registered in respect of such goods” and “pirated copyright goods” are defined as unauthorized direct copies of protected articles the making of which would have infringed either copyright law or related rights law in the country of importation. Id. art. 51 n.14.

84. See TRIPS Agreements, supra note 7, arts. 63-64; Understanding on Disputes, supra note 10.


86. See, e.g., Legal Hybrids, supra note 13, at 2483-88. Arguably, copyright protection of computer programs converts that law into a de facto industrial property law; the generous modalities of copyright law, as devised to regulate the specialized market for cultural goods, then disrupt the general products market, which the patent paradigm supposedly governs. See further Collapse of the Patent-Copyright Dichotomy, supra note 14.

87. See supra note 10; see generally Universal Minimum Standards, supra note 8, at 385-88.
ally.\textsuperscript{88} It would also preclude the accused state from imposing unilateral sanctions of its own without risk of retaliation by the trading community as a whole.

2. \textit{Scope of Protection}

The shortcomings inherent in the TRIPS approach surface the moment one turns from wholesale copying of computer programs to the practice of reimplementing functional components of a protected program in \textit{"clones, \ldots near clones \ldots [and] partial clones"};\textsuperscript{89} that is, in programs that are independently coded and that yet deliver essentially the same functional performance or behavior as the originator's own software. The competitor's non-literal \textit{"copying,"} in whole or substantial part, may imitate functional design aspects of the originator's program, but will not usually duplicate the code except as needed to achieve interoperability or to extract noncopyrightable ideas.\textsuperscript{90} In such cases, the copyright holder's efforts to prove infringement have generally been unavailing, at least in the United States federal appellate courts.\textsuperscript{91} Neither the TRIPS Agreement nor the Berne Convention seem likely to reverse this trend because they say little or nothing about the scope of protection that copyrighted computer programs should receive \textit{"as literary works."}

As noted, the TRIPS Agreement (but not the Berne Convention) does specify that copyright protection shall extend only \textit{"to expressions and not to ideas, procedures, methods of operation or mathe-}

\textsuperscript{88} The propositions in the text ignore the effect of emerging customary international norms. \textit{See, e.g.,} Charney, \textit{supra} note 2, at 531-33 (espousing tacit consent theory of customary norms if states participated in forums for multilateral law-making initiatives).

\textsuperscript{89} \textit{See} Samuelson et al., \textit{Manifesto, supra} note 13, at 2381. As to the nature and size of software entities, the \textit{Manifesto} distinguishes among five such entities: program code (as a behaving entity); program compilations as a whole (the industrial design of program behavior and the internal components responsible for producing it); subcompilations (subsets of program behavior or internal design for producing behavior); algorithms (finite procedures for solving particular problems); and features (coherent units of program behavior). \textit{Id.} at 2379. Copyright law protects only program code from wholesale or partial appropriations. \textit{Id.} at 2347-61. Concerning the similarity of product and market dimensions, the \textit{Manifesto} distinguishes among: 1) exact duplications of program code; 2) clones and near-clones (which are identical or near-identical compilations of program elements, whether program behavior or the industrial designs responsible for program behavior); 3) partial clones (clones of subcompilations); 4) substantially similar program compilations; 5) substantially different program compilations; and 6) programs with the same general functionality but different particularized functionality. \textit{Id.} at 2381-405.

\textsuperscript{90} \textit{See id.} at 2395-405.

\textsuperscript{91} \textit{See infra} notes 100-102 and accompanying text. Whether the United States Supreme Court will approve this trend remains to be seen. \textit{See} Lotus Dev. Corp. v. Borland Int'l, Inc., 49 F.3d 807 (1st Cir.), \textit{cert. granted,} \textit{U.S.}, 116 S. Ct. 39 (1995).
matical concepts as such.92 But the implementation of this idea-expression distinction is left to the domestic laws, and the Berne Convention lays down no detailed guidelines to determine the scope of protection beyond literal copying.93 Thus, WTO panels engaged in dispute-settlement proceedings must once again fall back upon state practice.94 State practice everywhere reflects a dilemma concerning the breadth of protection to be afforded copyrightable computer programs,95 especially with regard to the copyright holder’s exclusive right to prepare derivative works.96

Most computer programs (and many computerized data bases) evolve through revision, adaptation, and transformation into an array of applications that are functionally “derived” from the data and instructions embodied in the program designer’s (or compiler’s) initial solution.

By persuading courts to overextend the exclusive right to prepare derivative works, copyright owners can assert proprietary claims to any subsequent innovations that exploit recognizable aggregates of the original data and instruction sets, even though the matter claimed to have been infringed contains... no personal expression and fulfills purely functional objectives.97

92. TRIPS Agreement, supra note 7, art. 9(2).
93. See, e.g., Dreier, supra note 69, at 232-34 (discussing W.I.P.O.’s proposed Protocol to the Berne Convention, which aims to reduce the ambiguities pertaining to scope of protection and other issues as matters stand); see also T. Vinje, The Legislative History of the E.C. Software Directive, in A HANDBOOK OF EUROPEAN SOFTWARE LAW, supra note 16, at 39, 79 (“The line between idea and expression will have to be drawn in each individual case.”). See also TRIPS Agreement, supra note 7, art. 13 (paraphrasing Berne Convention, supra note 11, art. 9(2), to the effect that states must “[c]onfine limitations or exceptions to the exclusive rights to certain special cases which do not conflict with a normal exploitation of the work and do not unreasonably prejudice the legitimate interests of the right holder.”). Cf. 17 U.S.C. § 107 (1988) (codified fair-use criteria).
94. See TRIPS Agreement, supra note 7, arts. 63-66; Understanding on Disputes, supra note 10 and accompanying text.
95. See, e.g., Dreier, supra note 69, at 227-30; Vinje, supra note 93, at 45-52, 56-79.
proves especially harmful when the “sets of instructions” or the “collections of data” at issue pertain to functionally efficient or standardized solutions that prudent second comers will prefer to work around in order to forestall actions for infringement. Carried to an extreme, the very process of standardization needed for the progress of artificial intelligence could enable early generations of programmers and systems analysts to lodge derivative work claims against those who use the unpatented prior art as components or building blocks in later, more advanced achievements.
As a result, domestic appellate courts wary of this pitfall tend increasingly to treat computer programs as functional works entitled to little more than "thin" protection against slavish imitation.\textsuperscript{98} This emerging state practice, in turn, substitutes a chronic condition of underprotection for the chronic state of overprotection that would otherwise suffocate unpatented, incremental innovation in this field.\textsuperscript{99}

In the United States, for example, the federal appellate courts apply a "successive filtering test" that bars a finding of infringement based on nonliteral similarities pertaining to "sets of modules necessary for efficient operations, to structural architecture bearing on efficiency, or to any technical ideas present in different structural subcomponents of the programs at issue."\textsuperscript{100} These courts refuse to find protectable expression in "elements dictated by external factors, including standard programming techniques, mechanical specifications, compatibility requirements, manufacturers' design standards, and functional demands [peculiar to] the industry being served."\textsuperscript{101} Important federal appellate decisions also condone the decompilation of an object code in the course of reverse-engineering noncopyrightable technical ideas or components that a second comer could not reasonably discover by other means. This decompilation is allowed provided the second comer independently creates his own end products without embodying the originator's protectable expression, espe-


\textsuperscript{98} \textit{See infra} notes 100, 102 and accompanying text.

\textsuperscript{99} \textit{See, e.g.,} Samuelson et al., Manifesto, \textit{supra} note 13, at 2330-43, 2347-61; \textit{Electronic Information Tools, supra} note 97, at 458-61.


\textsuperscript{101} \textit{TRIPS Component, supra} note 8, at 231. \textit{See supra} note 100 and accompanying text.
cially code. The United States Supreme Court will soon determine the extent to which these principles also apply to user interfaces.

Whether European courts operating under domestic laws that implement the Council Directive on Computer Programs will reach comparable results also remains to be determined. Meanwhile, the EC Directive already constitutes a tailor-made law that modifies the classical copyright paradigm in subtle and sometimes controversial ways that have few counterparts in prior state practice. Knowledgeable observers predict that the Directive as judicially interpreted will ultimately provide only "thin" protection against wholesale copying, and they welcome this outcome as a victory for European policymakers.

If these tendencies prevail at the international level, copyright protection of computer programs under the TRIPS Agreement will provide a basis for preventing wholesale duplication of outer, expressive features, whether in source or object code. But neither copyright laws nor trade secret laws, as reinforced by the TRIPS Agreement, prevent reimplementations of functionally equivalent behavior by proper means. Moreover, they will not impede competi-


104. See supra note 68.

105. See, e.g., Vinje, supra note 93, at 79-81; Pamela Samuelson, Comparing U.S. and E.C. Copyright Protection for Computer Programs: Are They More Different Than They Seem?, 13 J.L. & COM. 279 (1994); infra note 106 and accompanying text.


107. See, e.g., Michael Lehmann, supra note 70, at 165, 172 (stating that "[t]he reverse analysis . . . permitted under Art. 5(3), combined with decompilation under Art. 6, can serve to determine the ideas and principles—theirselves free of copyright—which underlie any program. . . . Free access to the ideas is therefore . . . guaranteed, and cannot be excluded by contract"). Cf. also Paul Goldstein, The E.C. Software Directive: A View from the United States of America, in A HANDBOOK OF EUROPEAN SOFTWARE LAW, supra note 16, at 202, 205-15.

108. See TRIPS Agreement, supra note 7, art. 10(1) (requiring protection of computer programs as literary works "whether in source or object code"); supra text accompanying notes 75-86.

109. See TRIPS Agreement, supra note 7, art. 39; infra text accompanying notes 118-127.
tors from imitating components that are functionally determined or that constitute standards of efficiency in the trade or other market-determined standards.\textsuperscript{110} A WTO panel empowered to investigate a member state’s allegedly inadequate protection of computer programs would thus have to conclude that, in the present state of uncertainty, the defendant state’s administrators and tribunals were largely free to follow the more restrictive lines of decisions implementing copyright protection for computer programs in developed countries, as indicated above.

If, over time, state practice evolves towards a stronger, more protectionist consensus, then deviant states might find themselves charged with “nonvoluntary acts of nullification and impairment” of benefits conferred by the TRIPS Agreement\textsuperscript{111} unless they agreed to broaden the scope of protection. This explains why the developing countries bargained for, and obtained, a five-year moratorium on claims of nonvoluntary nullification and impairment.\textsuperscript{112} At present and for the foreseeable future, however, the prospects strongly favor the “thin protection” doctrine that the United States federal appellate courts have lately developed, unless the Supreme Court disavows this approach.\textsuperscript{113} Even then, the United States Supreme Court does not make law for the rest of the world, and especially not for the developing countries. Moreover, facile claims of “nonvoluntary acts” stemming from scope of protection issues on which no firm consensus has emerged could backfire if they lead WTO panels to resolve controversial intellectual property issues at the international level, with adverse repercussions on domestic firms or industries whose own legislative and administrative authorities were thereby circumvented.\textsuperscript{114}

One further disadvantage of the TRIPS approach to computer programs deserves emphasis here. It seems that the developed countries’ negotiators—in pressing for the treatment of computer programs “as literary works”—have overlooked or downplayed the fact


\textsuperscript{111} See TRIPS Agreement, supra note 7, art. 64(1); Universal Minimum Standards, supra note 8, at 385-87.

\textsuperscript{112} See TRIPS Agreement, supra note 7, art. 64(2).


\textsuperscript{114} See GATT Connection, supra note 1, at 861. But see Geller, supra note 38, at 107-14 (favoring actions by WTO panels to fill gaps in international intellectual property law).
that the developing countries were already entitled to differential and more favorable treatment with respect to copyrightable literary works under the Appendix added to the Berne Convention in 1971. In this connection, developing countries that have long complained about the high prices their students and trainees must pay to acquire computer programs for educational and scientific purposes may attempt to invoke the compulsory licenses provided in the Appendix for these purposes.

In retrospect, as this author’s previous studies have shown, the decision to entrust the protection of computer programs to the Berne Convention and the TRIPS Agreement “as literary works,” with no corresponding prohibitions against the copying of non-copyrightable functional components, may boomerang against its proponents at the international level. In effect, it endows competitors “who are willing to master lawful techniques of reverse engineering” with broad latitude to imitate the foreign originators’ non-copyrightable know-how without any corresponding burdens to contribute to the originators’ costs of research and development.

C. Trade Secrets and Unfair Competition Law

Paradoxically, software producers may ultimately benefit as much or more from provisions in the TRIPS Agreement requiring WTO members to protect undisclosed information and to repress unfair competition as from the copyright provisions analyzed above. In particular, Article 39(2) provides that “[n]atural and legal persons

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115. In principle, the TRIPS Agreement—unlike prior multilateral trade agreements—provides no special regime that weakens the international minimum standards as such for developing countries. Instead, the TRIPS Agreement distinguishes among developed, developing and least-developed countries primarily for purposes of differentiating the length of the grace periods during which these countries may respectively delay implementation of the substantive international minimum standards. See TRIPS Agreement, supra note 7, art. 65(1) (one-year transition period for all member countries), 65(2), (3) (five-year transition period for developing countries), 66(1) (ten-year transitional period for least-developed countries). For the view that both developing and least-developing countries will, in practice, be able to assert de facto claims to preferential treatment under other provisions of both the TRIPS Agreement and the WTO Agreement, supra note 5, see generally Universal Minimum Standards, supra note 8, at 385-88 (“Uncertainties of the Dispute-Settlement Process”).

116. See Berne Convention, supra note 11, Appendix; TRIPS Agreement, supra note 7, art. 9(1); GATT Connection, supra note 1, at 822-27 (“Preferential treatment under the Copyright Conventions”). See generally S. Ricketson, supra note 96, at 624-64.

117. See TRIPS Component, supra note 8, at 234-35.

118. See id. at 233-34; See also infra text accompanying notes 121-126.

119. See TRIPS Agreement, supra note 7, art. 39.

120. See id. art. 3(1) (incorporating Paris Convention, supra note 11, art. 10bis by reference).
shall have the possibility of preventing information lawfully within their control from being disclosed to, acquired by, or used by others without their consent in a manner contrary to honest commercial practices” so long as such information remains secret, has commercial value, and has been subject to reasonable steps to keep it secret.\textsuperscript{121} Examples of the honest commercial practices the drafters had in mind are spelled out in a footnote to Article 39(2).\textsuperscript{122} A failure to observe these practices in connection with internationally traded goods, including software, is understood to violate Article 10bis of the Paris Convention as well as Article 39 of the TRIPS Agreement.\textsuperscript{123} By the same token, Article 10bis of the Paris Convention, which is automatically incorporated into the TRIPS Agreement, elevates practices that deceive or confuse consumers to the level of a universal tort, actionable within the purview of the TRIPS Agreement’s overall enforcement machinery.\textsuperscript{124}

While a detailed analysis of these provisions lies beyond the scope of this paper,\textsuperscript{125} companies that establish themselves in developing countries, either directly or through licensees, should especially benefit from them. For example, once domestic laws to protect undisclosed information are enacted in conformity with Article 39, a competitor whose conduct violates its provisions may become incapable of profiting, at least for a reasonable period, from the improper acquisition of functional know-how that copyright laws otherwise left unprotected.\textsuperscript{126} Similarly, the unfair competition norms incorporated into the TRIPS Agreement via Article 10bis of the Paris Convention allow even distant suppliers to complain locally about practices that deceive or confuse consumers, like those currently prohibited under section 43(a) of the Lanham Act in the United States.\textsuperscript{127} Competitors who

\begin{footnotesize}
\begin{enumerate}
\item[121.]
TRIPS Agreement, supra note 7, art. 39(2).
\item[122.]
Id. art. 39(2) n.10, which states: For the purpose of this provision, “a manner contrary to honest commercial practices” shall mean at least practices such as breach of contract, breach of confidence and inducement to breach, and includes the acquisition of undisclosed information by third parties who knew, or were grossly negligent in failing to know, that such practices were involved in the acquisition.
\item[123.]
See supra notes 120-121.
\item[124.]
See supra note 120; Competition Law, Intellectual Property Rights, and International Trade, supra note 14, at 106-07.
\item[125.]
See Universal Minimum Standards, supra note 8, at 377-79, 381.
\item[126.]
\item[127.]
See, e.g., DORIS E. LONG, UNFAIR COMPETITION AND THE LANHAM ACT 94-170, 213-26 (1993); BODENHAUSEN, supra note 85, at 142-46; see also J.H. Reichman, Design Protection and the New Technologies: The United States Experience in a Transnational Per-
\end{enumerate}
\end{footnotesize}
otherwise imitate only noncopyrightable, functional components of a foreign national's computer programs may, by copying trademarks or trade dress at the same time, become liable on these grounds without violating the copyright laws as such.

II

Closing the Know-How Gap in the TRIPS Agreement

The hard truth this analysis confirms is that the world's intellectual property system, as currently constituted, is not equipped to deal with the real problem posed by twenty-first century technological development, namely: how to protect subpatentable advances in technical and scientific know-how that are costly to develop and yet easily appropriated when applied to industrial products distributed in the open market.128 Two recently published monographs in the Columbia Law Review deal exhaustively with this topic. One, entitled Legal Hybrids Between the Patent and Copyright Paradigms,129 explores the need for a general purpose innovation law, built on modified liability principles, that would stimulate investment in all technological pursuits whose products and processes obtain inadequate protection from either the domestic patent and copyright laws or from classical trade secret laws. The second monograph, entitled A Manifesto Concerning the Legal Protection of Computer Programs,130 is the joint product of two technical experts, Professor Randall Davis of the Massachusetts Institute of Technology, and Mitchell Kapor, founder of the Lotus Development Corporation, and two law professors, Pamela Samuelson of Pittsburgh University, and this writer.131 The Manifesto identifies the true sources of value in computer programs and explains in a techni-

128 See generally Legal Hybrids, supra note 13, at 2436-42, 2504-27 (market failure due to contraction of lead time in design dependent technologies under modern conditions, synthesized in the problem of “incremental innovation bearing know-how on its face”).
129 Legal Hybrids, supra note 13.
130 Samuelson et al., Manifesto, supra note 13.
131 See further supra note 13.
cally sound manner why they fall through the gaps in the domestic and international intellectual property systems. To protect the functional components of computer programs that find no refuge in existing legal regimes, the Manifesto proposes a modified liability regime that overcomes the problem of market failure without creating new barriers to entry or other anti-competitive effects characteristic of exclusive property rights.\(^{132}\)

The following observations draw from and briefly summarize some of the main findings set out in these monographs, with a view to indicating the author's overall solution to the deeper problems raised in this study.

A. A Market-Oriented Framework for Protecting Program Design

The Manifesto argues that software producers need some form of protection from competitors who quickly enter the market with clones and near clones,\(^{133}\) but that exclusive property rights derived from the patent and copyright paradigms fail to solve the real problem because they trade the prospects of chronic overprotection for the state of chronic underprotection innovators now face. The real problem is not the protection of "text" or code, which is what attracts copyright protection and leads to the dead end discussed in this study. Rather, the main source of value in computer programs lies in the useful behavior produced when program instructions are executed. In other words, purchasers "pay substantial sums of money for a program not because they have any intrinsic interest in what its text says, but because they value what it does and how well it does it (its behavior)."\(^{134}\)

This valuable behavior results from the industrial design phase of software development, including the design of its interfaces, and not from writing the source code to implement it, which is far less creative and intellectually challenging, and commands a relatively insignificant share of the innovator's overall investment in research and development.\(^{135}\) The problem is that the software designer's know-how responsible for the valuable behavior that attracts consumers becomes embodied in or near the surface of the program itself and cannot be

\(^{132}\) See also Collapse of the Patent-Copyright Dichotomy, supra note 14 (comparative and historical analysis of the gaps in the international intellectual property system as structured in the late nineteenth century). The models that are explored in the context of computer programs, see Samuelson et al., Manifesto, supra note 13, at 2413-29, illustrate the approach that an innovation law ought to take with respect to application of modern technological know-how to industry in general. See Legal Hybrids, supra note 13, at 2529-57.

\(^{133}\) Samuelson et al., Manifesto, supra note 13, at 2532-65.

\(^{134}\) Id. at 2318.

\(^{135}\) See id. at 2327-31.
kept under lock and key in the factory, as would be the case with conventional machinery. Any competitor who lawfully obtains a copy of a computer program may be able to duplicate quickly its functional design know-how without having to invest in the high cost of reverse-engineering that second comers had typically to defray in order to compete with innovators in a pre-digital age.136

The vulnerability of the software producer’s investment in design-rich technical solutions to trivial acquisition by second comers thus creates a risk of market failure. This, in turn, destabilizes the legal and economic machinery that usually drives innovation by balancing incentives to create against the benefits of free competition. More specifically, cloners and near cloners may deprive software developers of “natural lead time,”137 and they foster risk aversion owing to the software innovators’ chronic fears of being unable to appropriate the fruits of their investments.138

136. See id. at 2332-42 (explaining that much of this design know-how is borne on the face of software products (i.e., revealed through use of the program or in user manuals) or near the face (i.e., accessible through decompilation of publicly distributed object code)); see also Programs as Know-How, supra note 110, at 652-67; Elmer Galbi, Proposal for New Legislation to Protect Computer Programming, 17 BULL. COPYRIGHT SOC’Y 280, 281 (1969). Cloners and near cloners may accordingly obtain the innovator’s costly know-how by what the Manifesto calls “trivial acquisition of behavioral equivalence.” See Samuelson et al., Manifesto, supra note 13, at 2337, 2381; see generally id. at 2332-41. They may also drive the innovators out of the market altogether by pricing their clones lower than the innovators’ average costs and by out-distributing them to the point where innovators cannot recoup their investment in research and development.

137. See supra note 136; Legal Hybrids, supra note 13, at 2438-41 (showing that the “temporary or ‘disappearing’ quantum of natural lead time” that trade secret laws (or other laws protecting confidential information) traditionally supplied “solves the free rider problem that would otherwise skew decisions to invest in the development of unpatented, noncopyrightable products and processes, without resort to arbitrarily imposed barriers to entry characteristic of all regimes built around exclusive property rights”); see also John C. Stedman, Trade Secrets, 23 OHIO ST. L.J. 4, 21 (1962).

138. See Samuelson et al., Manifesto, supra note 13, at 2378. The Manifesto states: Market failure is likely if the quantum and significance of the entity taken is substantial, the second comer’s development effort is rapid, easy, and highly dependent on the first comer’s product, the degree of similarity in the resulting products approaches identicality, and the second comer’s market is proximate to that in which the first comer operates. The converse is also true: the smaller the taking, the less dependent the creation, the less similar the results, and the less proximate the markets, the less likely it is that a second comer’s borrowing will undermine the first comer’s incentives to invest in innovation.

Id. at 2378-79. See also Wendy J. Gordon, Asymmetric Market Failure and Prisoner’s Dilemma in Intellectual Property, 17 U. DAYTON L. REV. 853, 861-67 (1992); Wendy J. Gordon, On Owning Information: Intellectual Property and the Restitutionary Impulse, 78 VA. L. REV. 149, 222-58 (1992) (discussing a proposed tort of “malcompetitive copying”). In this context, the Manifesto suggests that the “look and feel” lawsuits are not really about the arrangement of user interface command terms, but about the imitation of program behavior, a phenomenon that has been obscured from view because the copyright
When software developers turn to the domestic intellectual property laws for relief against this threat of market failure, they are either sadly disappointed or unduly overcompensated. They will normally be disappointed by classical patent doctrines, which deny protection for routine or incremental innovation; by classical copyright doctrines, which deny protection for functionally determined design solutions as such; and by classical trade secret laws (or equivalent laws of confidential information), which only supply innovators with natural lead time when they keep their know-how secret and do not embody it in products distributed in the open market. Yet, these legal regimes will sometimes unduly reward the very same innovators if, for example, the latter persuade the patent office to lower the standard of non-obviousness in order to rescue functional designs that have nowhere else to go; or if they persuade courts to expand traditional copyright law to rescue functional design components of programs and interfaces that have nowhere else to go; or if, by chance, they can avoid public distribution altogether and license their programs under two-party transactions that forbid reverse-engineering even by honest means.

The *Manifesto* proposes to curb this risk of market failure by addressing the real problem at issue, which is the inability of trade secret laws to supply software innovators with natural lead time in which to recoup their investment in the functional design components of their products. The goal, however, is not to reward innovators with exclusive property rights in less than nonobvious innovation, but rather to restore the basis for healthy competition in a manner that is the least disruptive of the normal competitive process.

vocabulary has no way of conceiving it. Similarly, the decompilation controversy is not really about the harm caused by intermediate reproductions of program code in the effort to discern its contents, but about the harm that may occur because the most valuable aspects of the internal design of programs cannot be adequately protected by existing legal regimes once they are discerned in the analysis phase of the decompilation process. See id. at 2339-42, 2350, 2389-93.

139. See Samuelson et al., *Manifesto, supra* note 13, at 2332-65; see also *Overlapping Proprietary Rights, supra* note 126, at 88-109, 122-24.

140. See *supra* notes 34-35 and accompanying text.

141. See *supra* note 97 and accompanying text.

142. See, e.g., *Competition Law, Intellectual Property and International Trade, supra* note 14, at 87-94; *Electronic Information Tools, supra* note 12, at 461-67 ("Public Interest at Odds with the "Two-Party Deal").

143. Samuelson et al., *Manifesto, supra* note 13, at 2378-413; see generally *Legal Hybrids, supra* note 13, at 2436-46, 2519-57.
B. Toward a New Intellectual Property Regime Built on Modified Liability Principles

To attain this goal, it is not necessary to change the existing copyright and patent laws, or otherwise to undermine the capacity of the former to protect text (and other forms of surface expression) or the capacity of the latter to protect applications of major breakthroughs in computer science to industry. It is necessary for reformers to address the right problem, namely, the second comer’s ability rapidly to acquire unpatented, noncopyrightable design solutions responsible for incremental improvements in program behavior. These advances become vulnerable to free-riding appropriators because classical trade secret law denies any quantum of natural lead time to innovators who cannot defend their subpatentable know-how by self-help measures to preserve and enhance actual secrecy. Yet, were trade secret law available, it would not provide innovators with exclusive property rights at all. On the contrary, it would only protect the innovator against the dishonest conduct of second comers who attempt to avoid the duty to reverse-engineer by proper means.145

144. Supra text accompanying notes 19-21, 31-35, 63-86.
145. See supra notes 121-126; see generally Legal Hybrids, supra note 13, at 2436-46. A study of the many legal hybrids proliferating in the penumbra between the patent and copyright paradigms suggests that the quintessential problem facing twenty-first century innovation in an information age is precisely this chronic shortage of natural lead time that results from the breakdown of classical trade secret laws (or equivalent laws of confidential information) under present-day conditions. See Legal Hybrids, supra, at 2453-520; Collapse of the Patent-Copyright Dichotomy, supra note 14, at 505-19. To overcome the resulting market failure, which depresses the level of aggregate investment in cumulative and sequential forms of unpatented innovation, see, e.g., Richard R. Nelson, Intellectual Property Protection for Cumulative Systems Technology, 94 COLUM. L. REV. 2674 (1994), the solution is to rationalize the economic functions of trade secret law and to obviate the arbitrary and capricious effects of its functional dependence on actual secrecy. On analysis, trade secret law turns out to be a kind of standardized agreement (a set of default liability rules) governing relations between innovators and borrowers with respect to unpatented innovation. These rules perform three essential functions: 1) they provide innovators with a period of natural lead time in which to try to recoup their investments; 2) they require borrowers to contribute to the technical community’s overall costs of research and development either indirectly, by investing in reverse engineering (and the improvements to which it usually leads), or directly, by purchasing the innovative know-how under licensing agreements; and 3) they trigger sister legal doctrines of misuse (drawn from anti-trust law) that prevent licensors of unpatented technical know-how from neutralizing their licensees’ technical abilities to compete with licensors beyond a reasonably short period of time. See Legal Hybrids, supra note 13, at 2519-29.

The Legal Hybrids monograph contends that a general purpose innovation law to protect applications of unpatented technical know-how to industry under modern conditions should perform these same economic functions without regard to the availability of actual or legal secrecy as such. Id. at 2533-44. Such a regime would provide those who invest in industrial applications of advanced technical know-how with 1) artificial lead time to overcome market failure; 2) with a menu of user’s fees
In this same vein, the Manifesto endorses a market-oriented set of default rules for protecting novel software designs that would implement modified liability principles, and not the exclusive property rights typical of other hybrid legal regimes. In particular, it recommends the application of such a regime to protect software producers against "clones, near-clones and partial clones" because the industrial compilations of applied know-how embodied in programs cannot adequately be protected by existing legal regimes.\textsuperscript{146} Anti-cloning protection should last "long enough to give developers sufficient lead time to develop a niche in the market, but not so long as to impede the incremental development of technology or the creation of new de facto standards in the marketplace."\textsuperscript{147}

To this end, the Manifesto combines two mechanisms for providing a market-preserving form of relief. The first mechanism is a short blocking period available to software developers from the first commercial distribution of their software products. The second one consists of the opportunity to register an innovative (but not inventive) program compilation or subcompilation as a way of providing the registrant with compensation for a second comer's use of the innovation after the expiration of the initial blocking period.\textsuperscript{148}

The proposed software regime would, of course, prevent wholesale cloning of novel functional features for a relatively short period of time, maybe for a three or four-year blocking period, available even to innovators who do not register their contributions with the relevant administrative agency. This would delay producers of programs that were substantially identical reimplementations of earlier programs from entering the market before the allotted period of artificial lead

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\textsuperscript{146} See Samuelson et al., \textit{Manifesto}, supra note 13, at 2369-71, 2422-25.

\textsuperscript{147} \textit{Id.} at 2423.

\textsuperscript{148} \textit{Id.} at 2422-26. The authors of the Manifesto do not provide a model law because their goal was to offer a useful framework for assessing what kinds of program innovations are in need of what kind of legal protection and why. The first step was to clarify the terms of the debate and set it on a firmer foundation than in the past, from which the construction of an appropriately minimalist legal framework becomes feasible. For the six structural elements of a general purpose innovation law that addresses these same concerns, see \textit{Legal Hybrids}, supra note 13, at 2544-57 ("In Search of a Community-Wide Know-How Transaction").
time had elapsed. In addition, if the innovator registered his novel industrial compilation in due course, the wholesale cloner would also have to pay the standard, automatic license (or user's) fees for a further relatively short period thereafter, for example, another three or four years after the initial blocking period had elapsed.149

This same set of default rules, however, would provide more favorable treatment to second comers who entered the same market segment with a substantially different (and probably improved) program that nonetheless borrowed a significant amount of functional components (i.e., industrial subcompilations) from the originator's registered industrial compilation. In this case, the second comer's willingness to defray the costs of producing a significantly different program, when viewed as a whole, should exempt him or her from the obligation to delay entry into the market under the blocking period lodged against wholesale cloners. Nevertheless, the second comer must pay reasonable royalties for the reuse of any borrowed subcompilations of applied know-how under the standard, automatic licensing provisions established by the relevant technical community for the prescribed period of time, say, three or four years.150

For example, if IBM's new "ThinkPad" program were registered under these rules, non-cloning competitors who rushed to reimplement its major functional improvements into their own programs would not suffer any significant delay in entering the same market segment beyond the time required to produce their own upgraded products. This is exactly what occurs under the copyright law as currently enforced, which provides no protection for ideas or functional matter as such.151 Under the proposed liability regime, however, these second comers—though violating neither the patent nor the copyright laws—would all contribute to IBM's costs of research and development, at least in proportion to the ratio between the value of

149. See Samuelson et al., Manifesto, supra note 13, at 2412-26. Because the relevant technical communities tend to consist mostly of firms that will be both innovators and borrowers at different times, it becomes feasible to devise a set of default rules regulating users' rights and liabilities with respect to the reuse of subpatentable noncopyrightable innovations that would aim to put both innovators and borrowers in a win-win position. Automatic licensing provisions along these lines could then ensure that innovators obtain reasonable contributions to the cost of research and development from borrowers who applied their innovations to socially productive uses, and that borrowers would have a constantly expanding flow of adequately funded innovation from which to borrow, without undermining the long-term public interest in free competition. See Legal Hybrids, supra note 13, at 2535-39, 2544-45 ("The Industrial Compilation"), 2545-48 ("Artificial Lead Time"), 2548-51 ("A Menu of Users' Liabilities").

150. See Samuelson et al., Manifesto, supra note 13, at 2412-20.

the amount borrowed from IBM and the overall value of their own products as a whole.\textsuperscript{152}

A legal framework to implement these proposals would provide “all prospective borrowers with a set of legal and business options that will necessarily enter into their own cost-benefit analyses . . . . [T]he position of single borrowers will then vary with the status of their own research and development at the times they must select from the menu of other permissible legal and business strategies.”\textsuperscript{153} Over time, the collection agency charged with administering these automatic licenses would find itself managing electronic repositories of applied know-how that were constantly entering and leaving the liability system.\textsuperscript{154} The resulting royalties should benefit the relevant technical community as a whole by ensuring that innovators, whose achievements ultimately prove their mettle in the marketplace, receive a rising flow of contributions to the continuing costs of research and development from all those who exploit these same achievements. At the same time, borrowers know they will have more and better innovation to borrow than would be the case if free-riding appropriators threaten market failure.\textsuperscript{155} Above all, this resort to liability rules

\textsuperscript{152} Something like this already occurs with respect to novel engineering projects deposited under an apposite sui generis regime related to the Italian copyright law, and it constitutes the one operative example of a default liability regime that bears some resemblance to the model under review. See Legal Hybrids, supra note 13, at 2477-78 (discussing Italian Copyright law, law no. 633 of April 22, 1941, as amended through July 29, 1989, art. 99, and citing authorities); see also Gustario Ghidini, Prospettive “protezioniste” nel diritto industriale, 64 Rivista di diritto industriale 77-80 (1995) (endorsing this approach to new technologies, including software). However, the Italian regime protecting novel technical drawings and engineering projects lasts too long—twenty years—and provides only an automatic license for reuse, but no artificial lead-time period like that discussed in the text.

\textsuperscript{153} Legal Hybrids, supra note 13, at 2540-41. For example, under the hypothetical set of facts discussed in the text, the model provides a second comer who was prepared to make substantial improvements with at least the following options: “1) enter the market quickly with his own product and its autonomously developed improvements; 2) enter quickly with his own product and with improved components borrowed from other innovators at scheduled rates; 3) enter quickly with his own product and with improved components licensed from other innovators; 4) delay entry beyond the specified period of liability and borrow unpatented, noncopyrightable components at will and without payment.” Id. at 2541-42. For other options under other scenarios, see generally id. at 2539-44 (“The Fair Follower’s Menu of Pro-Competitive Legal Options”). In all cases, “the fair followers’ cost-benefit analysis must take into account the differentiated liabilities, if any, attaching to different strategies of use under the standard default regime, in addition to his own autonomous costs of research and development.” Id. at 2542.


\textsuperscript{155} See Legal Hybrids, supra note 13, at 2533-39 (“Off-the-Rack Liability Rules Allocating Contributions to the Cost of Research & Development”).
avoids the top-down market distortions characteristic of exclusive property rights by allowing single firms to choose from a menu of inherently pro-competitive options in the light of their own business needs and strategies.\footnote{156}

A more detailed discussion of these proposals exceeds the scope of this paper. Nevertheless, the authors of both the Manifesto and the Legal Hybrids monographs believe this extended framework has sufficient generality to serve as the basis for a new paradigm of intellectual property law. The Manifesto provides a number of working models for implementing such a framework with respect to computer programs.\footnote{157} Similar models could cut through the legal thickets that currently surround proposals to protect industrial designs, electronic databases, products of biogenetic processes, and other products of applied know-how.

Once such regimes prove their worth in actual practice, a general purpose know-how law, built on modified liability principles, becomes a feasible alternative to the proliferation of hybrid regimes of exclusive property rights that are currently undermining the competitive ethos from within.\footnote{158} A general purpose know-how law along these lines could then be embedded in either Article 10bis of the Paris Convention, or in a separate section of a revised TRIPS Agreement. Something like this already occurred with respect to semiconductor chip designs (which entered international industrial property law in fewer than ten years)\footnote{159} and to the provision concerning the protection of undisclosed information (which represents a case of instant international law).\footnote{160} Until then, one may safely predict that the “know-how gap in TRIPS” will continue to limit the relevancy of this Agreement for twenty-first century economic development.

\footnote{156} See id. at 2539-44; supra text accompanying note 153.
\footnote{157} See generally Samuelson et al., Manifesto, supra note 13, at 2413-29.
\footnote{158} See Competition Law, Intellectual Property Rights, and International Trade, supra note 14, at 83-98; Collapse of the Patent-Copyright Dichotomy, supra note 14, at 94-98.
\footnote{159} See TRIPS Agreement, supra note 7, arts. 35-38; Universal Minimum Standards, supra note 8, at 373-75.
\footnote{160} See TRIPS Agreement, supra note 7, art. 39; supra notes 119-126 and accompanying text.