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Conceptual Framework for Analyzing Intellectual Property Rights Issues

INTRODUCTION

An intellectual property system is made up of laws and practices and the relationships they generate among individuals and institutions. A system of this kind reflects the larger society of which it is a part. For, although intellectual property rights have been recognized in natural law, historically, governments have granted such rights to achieve a variety of policy goals. This is equally true today. Which policy goals a particular intellectual property system is designed to serve depends, in large measure, on history, circumstances, and the overriding needs of society.

Technological change has been one factor that has had an especially significant influence on both social systems and the intellectual property systems that arise from them. Today, it is posing a formidable challenge to the intellectual property system. Developments in information and communication technology are threatening to outpace previous technological advances in both speed and scope. They are stressing the intellectual property system to the point of raising fundamental questions about the system itself. This chapter presents a theoretical overview of the intellectual property system, and identifies how technology may influence it. It is deliberately abstract, intending to lend perspective to questions whose political and economic significance may make objectivity difficult to achieve.

The U.S. system of intellectual property rights and practices evolved in a way that balances social, political, and economic interests. The system has been modified, both formally and informally, in response to events and circumstances. Its basic framework was set in Section 8, Article 1 of the Constitution, which authorized Congress to grant exclusive ownership rights of writings and inventions for a limited period of time. The purpose was twofold: 1) to foster the progress of science and the useful arts, and 2) to encourage the creation and dissemination of information and knowledge to the public.

Although this framework was originally designed to deal with the problems and opportunities afforded by the invention of printing—the information technology that dominated the 18th century–it has proven flexible enough to accommodate a variety of new technologies. Today, however, advances in technologies such as microelectronics, fiber optics, and satellites are testing the limits of this flexibility. Developments in areas such as biotechnology[1] are also influencing the system, but they are beyond the scope of this study.

Bringing swift changes in computers, communications, and other information technologies, these technological advances are likely to have a major social impact, carrying us further into a new "information age." The new technologies transmit information dramatically faster, and they can collect, store, manipulate, and transmit larger amounts of it. With these new technologies, more people can gain access to information, which they can more readily use to trace past actions and predict or influence future events. In the next few decades, as these technologies continue to be developed, they will be used for an ever-expanding number of activities and tasks. This

[1]Although biotechnology has many similarities to information technologies in terms of its having a direct impact on the intellectual property system, this report does not discuss these impacts in detail. Given the magnitude of the impact that the development of biotechnology might have on society, any discussion in this report, which focuses on information technologies cannot do justice to this topic. For a discussion of some of these issues, see U. S. Congress, Office of Technology Assessment, *Commercial Biotechnology: An International Analysis*, OTA-BA-218 (Washington, D.C.: U.S. Government Printing office, January 1984).

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advance of technological frontiers will change, in equally significant ways, the structure of the social, economic, and political orders.

Just as the technologies of the 18th century shaped the intellectual property system as we know it today, so too are the new information and communication technologies likely to alter significantly how society views intellectual property, the mechanisms employed to protect it, and the value that society places on intellectual properties, both as market goods and as public resources. Although information and communication technologies will touch all areas of intellectual property law, they are likely to have the most immediate and pronounced impact on copyright, the area of intellectual property law that has been most concerned with the flow and use of information in society. Moreover, to the extent that traditional legal categories cannot accommodate these technologies, new kinds of intellectual property law may be required.

This report examines how technological developments might affect the intellectual property system. Each chapter focuses on one part of the system.

THE NATURE OF TECHNOLOGY

Technology can be defined in many ways, both broad and narrow. Some older definitions limit technology to mean specific tools or machines. Other theorists define technology more broadly as know-how: "a system of knowledge intended to have a practical bearing."[2] Beyond this, one can also include in a definition of technology the human processes and relationships required to bring a scientific idea to lifes

People chose their definition of technology to suit the question they are asking and the problem they must solve. Scientists and engineers, for example, may have less need to consider human factors, and so their definitions concentrate more on machines and physical structures—roads, airports, and nuclear reactors.[4] But a purely mechanical definition of technology would be inadequate for a study analyzing how technology affects the intellectual property system. Technology touches this system directly and indirectly, affecting its laws and rules and influencing the social and economic conditions in which relationships take place. To illustrate the potential effect of technology in both these spheres, we must broaden the focus of the analysis and include in it the areas where physical objects and people meet. As Todd La Porte has said, one must look at "who is technology," as well as "what is technology."[5]

This report defines technology broadly, incorporating relationships and transactions between creators, publishers, distributors, and users of intellectual property as well as the hardware they use. To maintain this view, while also allowing for independent analysis of machines, tools, and techniques, we will consider technology a "package' that, to borrow from Langdon Winner's categories, comprises:[6]

> *apparatus:* the physical devices of technical performance such as tools, instruments, machines, etc;
>
> *techniques:* the technical activities, such as skills, methods, procedures, and routines that people engage in to accomplish tasks; and

[2] Jay Weinstein, *Sociology Technology: Foundations of Post-,4 cademic Science (*New Brunswick, London: Transaction Books, 1982), p. X 1. For this view, see also J.K. Fiebleman, "Pure Science, Applied Science, Technology Engineering: An Attempt at Definitions, " *Technology and Culture,* fall, 1961, pp. 305-3 17; and C. Susskind, *[Understanding Technology* (Baltimore, MD: Johns Hopkins University Press, 1973).

[4] For a discussion of technology understood as "a form of social organization, see Todd R. La Porte, *Technology' as Social Organization,* Institute of Governmental Studies, Working Paper #84-1, University of California, Berkeley.

[5] Ibid.

[6] I bid., p. 8.

[6] For a study that conceives of technology as a package, see James N. Danziger, William H. Dutton, Rob Kling, and Kenneth L. Kramer, *Computers and Politics: High Technology' in American Local Governments (New* York: Columbia University Press, 1982).

> *social arrangements:* the relationships that are established and the transactions that take place allowing people to carry out technical processes and to give physical form to their ideas.[7]

Using this definition, this and subsequent chapters are based on a broad model of the relationship between technological and social change.[8] In this model, technology is considered to be one of many factors influencing society, while society is viewed as affecting technological development through its structures, laws, and practices.

[7]Langdon Winner, *Autonomous Technology: Technics-Out-of-Control as a Theme of Political Thought* ([Can] bridge, MA and London, England: the M IT Press), pp. 11-12,

[8]The study of technology and society has a long history going back two centuries to the works of Adam Smith, Henri Saint-Simon, and Karl Marx. In fact, it was the growing interest in technological developments that gave birth to the field of sociology. Interest has intensified in recent years, as both scholars and policy makers have sought to anticipate and ameliorate the unintended consequences of the deployment of technology. Once again, these interests have given rise to a new field of study, that of technology assessment. For two accounts of the history of ideas about technology, see Weinstein, op. cit., and Winner, op. cit.

THE INTELLECTUAL PROPERTY SYSTEM AND ITS RELATIONSHIP TO SOCIAL AND TECHNOLOGICAL CHANGE: A FRAMEWORK FOR ANALYSIS

The Intellectual Property System

Theoretical models and actual systems often differ significantly. In the real world, the form and structures of intellectual property systems are worked out in the political arena. Seldom is a system a well-conceived and well-designed construct; it is more likely to take shape haphazardly, reflecting the political compromises and historical events that went into its making. The American intellectual property system is a product of such compromises, and strong forces are still shaping it today. Those involved in the debate often define issues narrowly, in terms limited to their own interests and world views. But, given the magnitude of the technological changes occurring, and their potential impact on the intellectual property system, it is extremely important to view the entire situation as a whole, in terms of the interrelationships of its parts.

In looking at how technology might affect the intellectual property system, it is useful to conceive of the system as a set of incentives and rewards designed to affect the behavior of individuals or organized groups engaged in creative or inventive activities. This system is divided into five interrelated parts:

1. policy goals that it seeks to accomplish,
2. property rights that provide incentives and rewards,
3. operating rules,
4. mechanisms by which policy goals are achieved, and
5. the realm of people and activities that the system is designed to influence.

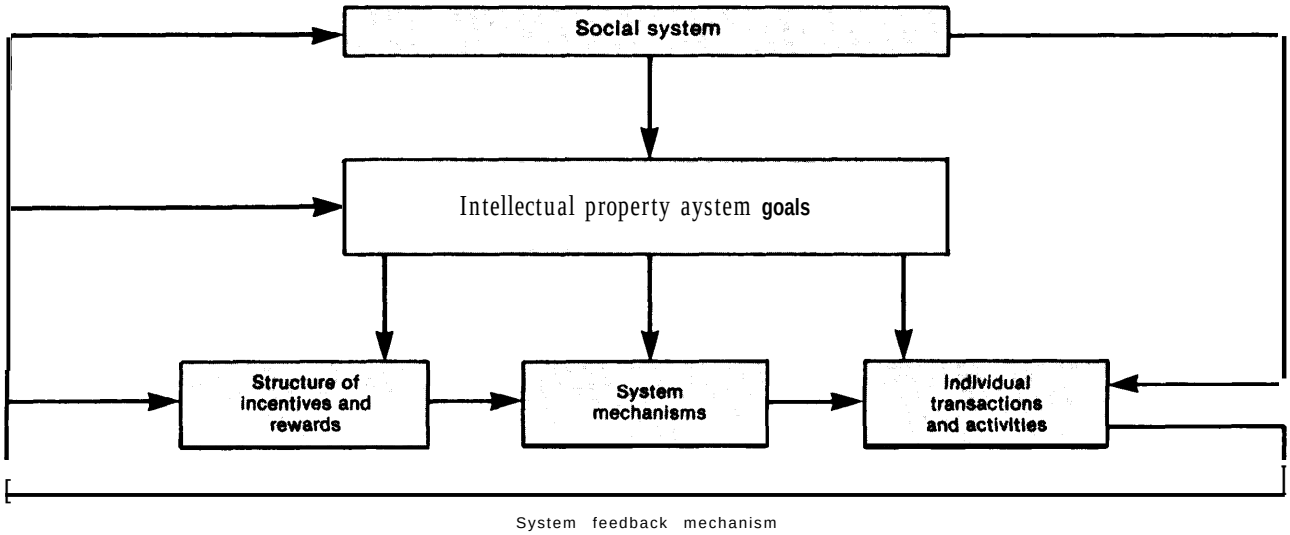
The intellectual property system can be visualized as shown in figure 1-1. As this diagram illustrates, the outputs of the system provide feedback about how effectively the system is working.

Policy goals are the ends towards which the intellectual property system is directed; they mirror the goals of the society. Thus, as illustrated in chapter 2, time and social change may alter intellectual property goals. As the goals change, other parts of the system are likely to change in response.

Property rights are granted as incentives and rewards. A property right might include, for example, one or any number of the following rights:[9]

[9]These terms were borrowed from Lawrence Becker, "The Moral Basis of Property Rights,. "*Property* J. Roland Penvork and John W. Chapman (eds.) (New York: New York University Press, 1980), pp. 189-190.

Figure 1-1.—The Intellectual Property System



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1. the right to possessor physically control something,
2. the right to use or enjoy its benefits,
3. the right to manage or decide how it is to be used,
4. the right to receive income from it,
5. the right to consume or destroy it,
6. the right to modify it,
7. the right to transfer it,
8. the right to distribute it, and
9. the right to exclude others from using it.

Rights may be granted only under certain conditions, or they maybe limited in their application. For example, to claim a patent in the United States, an inventor must demonstrate that his invention is useful, nonobvious, and novel. To receive a copyright, an author's work must be original.[10] Neither right offers permanent protection. Patent rights generally last for 17 years, and copyrights are granted to individuals for life plus 50 years and to corporations for 75 years.

Together, these rights, incentives, and the conditions under which they are granted constitute the operating rules of the intellectual property system. The rules make demands on everyone involved in the system. The granting of a right to one party, for example, may in effect create a corresponding obligation or liability on the part of another. Structuring the way the parties relate to and depend on one another, these rights and incentives serve as the rules governing the behavior of individuals involved in the creation, production, distribution and use of works, products, and services designated as intellectual properties.

Different intellectual property systems may define intellectual properties differently, and each may attach different rights, responsibilities, and benefits to them. The structure of rights will be determined, in part, by the policy goals of the system, and by the mechanisms chosen to achieve them. Thus, a system designed primarily to encourage learning and invention, as is American patent law, may require inventors to disclose information. In contrast, a system designed principally to regulate economic relationships, such as trade secret law may, in fact, prohibit disclosure. Similarly, a copyright system with the chief goal of fostering the dissemination of information might grant rights only in published works; whereas one aiming to reward author-

[10] The word "work' is a general term referring to any intellectual creation. It is used in the legal sense to distinguish particular copies from what is protected by copyright.

ship might protect works before they are made publicly available.

Similarly, the mechanisms used to achieve policy goals—the way in which the system operates-can vary among and within systems, depending on the kind of work to be protected, the nature of the activities to be influenced, the kinds of rights to be granted, and the policy goals to be achieved. For example, a system that grants rights on the condition of an act such as publication, or on the condition of qualities such as usefulness or novelty, might require a very different administrative apparatus than a system with no such conditions. We see, for example, that because patents are granted under more stringent conditions than copyrights, the Patent and Trademark Office historically has had more resources and administrative responsibilities than the Copyright Office has had.

The people, institutions, and activities that the intellectual property laws aim to influence are also crucial elements in the system. What activities these people do, as well as the socioeconomic constraints under which they operate, determine whether a particular incentive or reward might achieve its intended policy goal. To be most effective, rewards and incentives must match the motivations, needs, and perceptions of the people they are designed to influence, and they must accurately reflect the kinds of activities that they pursue. If an incentive miscalculates the economics of creating, producing, and distributing an intellectual property, it will not motivate people to keep creating. In addition, because people creating different forms of intellectual property operate in different environments and have varying concerns, they may respond best to different kinds of inducements.

The outputs of the intellectual property system—such as the amount, quality, and diversity of works—reveal, in part, how well it is working. But a number of difficulties arise in any effort to evaluate a system's performance. First, there are problems in selecting criteria that best measure effectiveness-that is, which results to note and which to ignore. Second, one cannot easily determine whether these criteria are being met. Finally, evaluating and assessing the accuracy and independence of the information needed to analyze the system is fraught with difficulty. At present, most of the information about such things as the extent of infringement, the potential economic damages of infringement, or the uses made of information-based products and services is available only from the stakeholders themselves.

The Intellectual Property System as a Dynamic System: The Impact of Technology

The dynamic nature of the intellectual property system further complicates its analysis. It exists within society, and shifts in response to social, political, and economic circumstances. Thus, when society values change, so may the motives and attitudes of creators, inventors, and users of intellectual properties. Similarly, changes in economic conditions can alter relationships and positions between and among individuals and groups in the system, redistributing their shares of financial obligations and rewards.

Of the many factors that might affect the intellectual property system, technological change is likely to have the greatest impact. We can see this clearly in examining the effects of new technologies on the intellectual property system.

Electronic information technologies are fundamentally different from print technology in a number of ways. For example, broadcasting technologies (radio, television) make a work simultaneously available in the homes of so many users that arrangements for payments for the transfer of works to them is often prohibitively expensive. Other technological advances, such as photocopiers and audio and video tape machines, have so reduced the cost and decentralized the process of copying works that rights holders are no longer assured that they have control over the production and integrity of their intellectual property. As infor-

Table 1-1 .–Characteristics of Information Technologies and the Uses of Intellectual Property

Technical characteristics of works	Uses of works
Mechanical print	
Produced in tangible "units" (but requires expensive machines and special skills to copy in large quantities)	Publishers, printers, and booksellers cooperate to publish work and sell units to individuals or libraries, authors received per-copy royalty on first sale of a copy; copyright holder retains rights to print *and publish "the work"*
Fixed in tangible copies (one 'canonical" form of "the work" exists)	Individuals read, scholars quote or cite; owner of a *copy* may copy parts of it by hand, or sell, rent, or destroy his *copy*
Analog electronic print	
"Originals" sold in tangible copies	E g , audio recordings and videocassettes are initially manufactured and sold somewhat like traditional, mechanically printed books
Reproducible at moderate cost (e. g., xerograhic copies, audio and video tapes)	Small works, or parts of large works, are often copied privately by users with *machines,* rather than by hand, copies of copies are poorer in quality than copies of *originals*
Decentralized	Many Individuals have equipment and skills to make copies
Technology-bounded	Different media and equipment usually needed to use and copy different types of works
Analog electronic broadcast	
Simultaneously available (one "intangible copy")	Advertisers may pay for work to attract potential customers to their product, alternatively, users may pay (e g , public broadcasting, subscription television)
Digital electronic	
Simultaneously available	Many Individuals may access a central store of works, a "data base"
Reproducible at very low cost	Prices for magnetic and optical storage media will continue to fall; media are *very high in capacity*, and very fast *in making reproductions:* perfect copies *can be made from copies*
Versatile	Many types of works (e, g , text, music, video-taped or filmed pictures) may be stored and communicated digitally
Decentralized and pervasive	Highly capable machines are becoming ubiquitous in homes and offices
Interconnected	Machines may be privately linked by switched telephone circuits: works can be transfered with Impunity; and joint authorship IS not restricted by the physical separation of the authors
Dynamic	Work may be Interactive or constantly evolving; one "canonical" copy may not exist
Processible	Machines may be programmed to transform and manipulate works, perhaps masking evidence of original authorship
Autonomous	Works may be *functional*, rather than only *meaningful,* as are traditional copyrightable works

mation technologies become computerized, the copy, transfer, and manipulation of works are becoming even more decentralized, speedy, and inexpensive.

At a basic level, the very definitions on which intellectual property rights are based take on new meanings, or become strained and even irrelevant, when applied to the context created by new technologies. They raise questions, for example, about what constitutes a' 'derivative work' when works are made available through intangible electronic waves or digital bits; about what constitutes a "work"; and about who owns the right to it when it is interactive, and when creators have combined their efforts to produce it.

The characteristics that differentiate the new technologies from the old, and that create potential problems for the system, are summarized above in table 1-1.

Changing technology may influence each part of the system directly, or it may affect it indirectly by modifying the larger social environment in which the intellectual property system operates. New technologies, for example, may affect the boundaries of the system and the nature of the rights that it provides. In doing so, they may change the "rules of the game" by which it operates. As discussed in chapter 3, each new technology has brought questions about whether and where it should fit into the existing system. Most recently, for

example, Congress, borrowing from both copyright and patent law, adopted a new suigeneris law, [1]that established a separate niche for computer chip technology in the intellectual property system.

Technological developments may also change the mechanisms used to achieve intellectual property goals. Chapter 4 points out that demonstrating "authorship' or "originality as a condition for receiving property rights, while relatively straightforward in a print culture, is much more complicated in an age of electronic technology. Similarly, as illustrated in chapter 7, a system that assumes copyright holders can enforce their own rights against infringement may operate unsuccessfully if decentralized reproduction and electronic transmission prevents identifying where and when infringements take place.

Because technology brings about new kinds of interactions between people, as well as new technological apparatus and new processes and techniques, it is also likely to affect the people, institutions, and activities that are part of the realm of the intellectual property system. As noted in many of the following chapters, new technologies not only affect what people do and how and why they do it, they also may restructure the socioeconomic opportunities available to them and the constraints under which they operate. And, in creating a multitude of new opportunities for application, use, and profit-making, issues may arise among the parties in the system the resolution of which, over the long run, may prompt changes in the goals, the boundaries, and the structure of the system itself.

[1]*Sui generis* is a latin phrase used to describe any law that is "of its own kind or class." *Sui generis* intellectual property law, then, is legislation that stands apart from existing patent, copyright, trademark, or unfair competition law.

THE APPROACH AND OUTLINE OF THE REPORT

Using the above model, this assessment analyzes the impact of the new information and communications technologies on the U.S. intellectual property system. Table 1-2 outlines the problems to be analyzed.

In this table, six major criteria are suggested to evaluate how well the system is functioning. Corresponding to these criteria are a number of research questions that might be asked to determine how well the criteria are being met, and some possible indicators of the system's effectiveness. The broad scope of the table illustrates the magnitude and complexity of the problem. It also suggests some useful questions around which to build an analysis, many of which serve as starting points in the following chapters.

The Emphasis on Copyright

In general terms, intellectual property law includes any law that grants rights in the products of the intellect. As such, it is a generic term that covers patent, copyright, trademark law, and the Semiconductor Chip Act, as well as trade secrets and tort misappropriation law. There are two major reasons for this emphasis. First, since copyright is concerned primarily with the use and flow of information and information-based products and services, it is the area of intellectual property law that will be most affected by advances m communication and information technologies. Second, it is to copyright rather than to other provisions that the creators, developers, producers, and distributors of new information technologies are looking in their efforts to gain legislative protection for their works.

This emphasis notwithstanding, we have tried to look broadly at the impact of technology on the entire intellectual property system. This broad perspective allows us to address not only the problem and opportunities that the new technologies present for the copyright system itself, but also to consider alternative ways, including some entirely new ones, of addressing them.

Table 1-2.— Framework of Analysis

Evaluative criteria	Questions for research	indicators/types of Information that might be collected
7. Effectiveness ***in meeting overall systems goals***		
A. Creation and dissemination of creative, informational, and scientific works	Degree of creativity	• Evaluations of creators, critics, users • Output of works • Number of prizes offered in these fields • Number of people engaged in these fields • Interactions of members of the creative environment
	Availability	• Number and variety of informational resources • Evaluations of creators, publishers, producers, users • Diversity of works • Price of works • Opportunities for access
	Congruence of incentives	• Evaluations of creators, publishers, and producers • Level of output
B. Enhancement of the learning environment	Degree of scientific and technological development	• Emergence of new fields • Number of scientists/technologists • Number and quality of scientific publications • Interactions between members of the scientific/technical community • Patents issued Ž Awards granted • Evaluations by members of the scientific/technical community
	State of the arts and entertainment	• Emergence of new fields • Number of creators • Condition of production/distribution industries • Availability of resources for creation/production/distribution • Awards granted • Market for creative works
	Overall condition of education	• Evaluations by national educators/businessmen/parents/National Science Foundation/etc. • Literacy rates • Test scores • Availability and qualifications of faculty/teachers • Quantity and quality of educational materials/information-based resources • Interactions among members of the educational community
C. Economic growth and development	Growth of information-based industries	• Development of new industries and profit-making opportunities • Percentage of employment • Number of firms • Contribution to gross national product • Use of information-based products and services in non-information industries
	International competitiveness	• Balance of trade
2. ***Efficiency in achieving goals***	Costs and benefits of granting rights	• Institutional costs • Transactional costs • Social costs in terms of achieving systems goals • Benefits measured in terms of achieving system goals • Estimates of harm due to infringement/lack of intellectual property protection • Profit margins • Industry competition • Estimates of economic value of intellectual property rights to proprietors

Table 1-2.—Framework of Analysis—Continued

Evaluative criteria	Questions for research	Indicators/types of information that might be collected
	Costs and benefits of alternative measures for achieving system goals	• Institutional costs • Transactional costs • Social/economic costs/benefit in terms of achieving system goals
3. ***Enforceability***	Extent of Infringement	• Public/institutional behaviors • Technologial capabilities to access/reproduce/ reformat information-based products and services • Privacy of use and decentralized access to reproductive/access/and communication technologies • Technological capabilities to preclude authorized access/use
	Ease of detection	• Transaction costs • Technological capabilities to monitor access/use
	Legitimacy of the system	• Public attitudes/support for the system
4. ***System durability***	Flexibility in the face of change	• Frequency of legislative revision/amendment Ž Resort to alternative forms of protection • Consensus in cases of first impression • Consistent/coherent application of law
	Legitimacy of the system	• Public attitudes/support for the system • Extent of infringement
	Ability to resolve conflicts/ harmonize interests	• Acceptance of decisions by parties in dispute—i.e., number of appeals
	Reliability/predictability as a guide to action	• Extent of unresolved issues — I.e., fair use, copyrightability of computer software
	Robustness of principles	Ž Internal coherence/consistency of law . Resort to other forms of protection • Overlap with other law
5. ***Precision as policy tool***	Predictability of outcome	• Quality, quantity, independence of available information
	independence/compatibility with respect to other policy areas	• Number of agencies involved • Cross-cutting issues • Interested congressional committees . Convergence of stake holder Interests • Intensification of issues
	Sensitivity to differences among different kinds of information-based products and services	• Roles of different kinds of Information-based products and services • Economics of different kinds of information markets • Public attitudes toward different types of information-based products and services • Technological characteristics of different information-based products and services
6. ***Congruence with international and other national systems***	Ability to resolve conflicts	• Enforcement mechanisms • Level of infringement • International court cases • Resort to other policies mechanisms to deter infringement— i.e., trade sanctions
	Harmony with other intellectual property systems	• Level and participation in international regimes • Scope of international treaties . Incompatibilities with international law — i.e., informalities
	Compatibility with other international regimes—i.e., GATT, UNESCO	• Policy conflicts and inconsistencies

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