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Intellectual property rights: the development of information infrastructures for the information society

Report

Intellectual Property Rights: The Development of Information Infrastructures for the Information Society

FINAL REPORT

A study carried out for the STOA programme of the European Parliament.

by

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Executive Summary

The legal rules and policies underlying the definition, granting, and enforcement of intellectual property rights (IPRs) are among the most important of Europe's interests in the construction of information infrastructures. This report summarises many of the technical, economic, and social issues that policy makers will need to consider in the area of intellectual property rights. It opens with a brief introduction to the copyright and patent IPR systems and the EU, national, and international systems governing the definition and enforcement of these rights. This section concludes by highlighting and making a policy action recommendation about an inconsistent treatment of copyright and patent rights under existing law that is of particular import for the construction of the information infrastructure.

The remainder of this report analyses the level and nature of copyright protection of authors and publishers in distributing information over information infrastructures. We begin by outlining the social constituencies benefiting from developments of the information infrastructure and identifying their expectations. We then consider the security issues involved in providing IPR protection to authors and publishers and some of the opportunities and constraints for improving protection. These security issues are then considered in the light of current developments in generating revenue through information services on existing telecommunication networks and the development of the "network of networks" approach uniting formerly unconnected portions of the telecommunication network. Our final section concludes that costs and benefits must be weighed in extending copyright protection and offers policy recommendations to accomplish this task.

Options Brief

Recommendation 1:

Interconnection and interoperability are vital in developing the information infrastructure needed by the information society. IPR protection should not provide for higher levels of protection to interfaces implemented in hardware than those currently given for software interfaces. This is likely to require change in patent law. Alternatively, regulatory policy measures should be enacted that have the same effect.

Recommendation 2:

Develop means to monitor the impact of efforts to achieve IPRs protection on the operation of data communication networks distributing public domain information such as those used in research communities, the effect of efforts to protect intellectual property on the availability of public domain information and user privacy, and the size of the existing and potential market for copyrighted works distributed over the information infrastructure.

Recommendation 3:

Develop means to monitor the use of existing information services to ascertain the growth of “public domain”, “related revenue”, and “direct revenue” constituency activities as an input into policy deliberations about strengthening copyright protection or increasing the security of public and private networks.

Recommendation 4:

Examine the effectiveness of copyright registration systems, the opportunities for public support of research to develop effective copy protection schemes that are broadly acceptable to both producers and users, and the reasons that existing copy protection schemes are not broadly utilised in all of the media relevant to the information infrastructure.

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1.0 Introduction

Technological, social, and economic innovations in the ways that information is generated and distributed are occurring at a rapid pace. Technological innovations are creating the possibility of bringing together voice, text, audio, and visual materials into a common digital format that can be stored, manipulated, and exchanged over telecommunication equipment and delivered to individual users' computers or "multimedia" equipment. Accompanying these technological innovations are shifts in the meaning of time, place, and distance due to the growing use of communication and information technology. These shifts open opportunities and provide impetus to the restructuring of people's work, recreation, and learning activities as well as how individuals interact with one another in pursuing these activities. The social and economic content of these changes is that they create new preferences and new markets which alter how people earn their living and spend their money and time. All of these changes, and more, are encompassed by the term "the information society." A defining characteristic of the information society is that the activities of creating, distributing, and consuming information are of growing importance in the lives of its citizens.

At the centre of these developments is the potential for dramatic improvement in the capacity of telecommunication networks to distribute information in digital format. If this potential is realised, it will provide a system for interconnecting information production and consumption activities on a global basis. Because such a system would provide support for an enormous range of production and consumption activities throughout the world it is referred to as the "global information infrastructure" or GII. In practice, however, the GII only exists as an abstract idea, a potential that may or may not be realised depending upon future developments.

What is happening now, however, is a growing attention to the improvement of national information infrastructures and to the possibility of a European-wide information infrastructure. Within Europe, there is a determination to make dynamic and innovative contributions to the construction of information infrastructures so that, if a GII is eventually to emerge, it will reflect European contributions, meet European needs, and contribute to the economic and employment growth of Europe. These goals can only be met if legal rules and policies support the technical, social, and economic requirements for constructing information infrastructures.

The legal rules and policies underlying the definition, granting, and enforcement of intellectual property rights (IPRs) are among the most important of Europe's interests in the construction of information infrastructures. This report summarises many of the technical, economic, and social issues that policy makers will need to consider in the area of IPRs. We do not attempt to resolve the

complex legal issues in this area nor do we suggest specific changes in European Union or member state law. We do, however, consider how legal theories and doctrines have influenced present understandings of IPRs and identify areas of law that should be examined closely. Our main concern is to identify the economic and social motives for IPRs protection and to critically examine whether these motives are consistent with social goals sought in the construction of a European and global information infrastructure.

1.1 Social Purposes and Intellectual Property Rights

Intellectual property laws extend the right of property protection under law to creations such as inventions, literary or artistic works, or trade marks. After a particular creation is granted protection under one of the several systems of IPR law it may be sold, licensed, or mortgaged. The goals that may be served by extending property right protection to creations include: 1) promoting invention and the authorship of new work by safeguarding the right of creators from others simply copying their ideas or works, 2) encouraging the dissemination of ideas and the disclosure of inventions to foster the creative activities of others, and 3) protecting the rights of authors to be recognised and to receive income from their work. IPR protection attempts to balance society's interest in the disclosure and dissemination of ideas by creating an exclusive right to control and profit from invention and authorship. It is possible to have either too little protection which will reduce the incentives for invention and authorship, or to have too much protection which will discourage the adaptation and improvement of ideas.

IPR protection interacts, and sometimes conflicts, with competition, trade, and social policy. The exclusivity of IPRs may create market power that would be a concern if it was achieved through the exclusive control of some other asset such as the only site for a shipping dock. Trade policies' search for reciprocity and competitive markets may come into conflict with international differences in intellectual property protection. Social policy seeks to promote education, health, environmental improvement, and a host of other objectives that may employ intellectual property. With some important exceptions, the right of the creator to legal protection is absolute, without regard to who violates, or for what purpose, IPRs. The cost of the incentive created by IPR protection is thus born by social actors as well as private commerce. While none of the conflicts provide a compelling reason to alter the existing systems of IPR protection it should be recognised that this system has costs as well as benefits.

The following section is a brief sketch of the copyright and patent system that focuses on principles

and institutions that are particularly relevant to the development of advanced telecommunication services and the information infrastructure. This section concludes by highlighting and making a policy action recommendation about an inconsistent treatment of copyright and patent rights under existing law that is of particular import for the construction of the information infrastructure. The remainder of this report examines the impact of IPR on particular social constituencies with an interest in the development of the information infrastructure, the potential conflicts among these constituencies, the problems of resolving these conflicts using present technologies and institutions, and the needs for policy action and attention to prevent these conflicts from reducing the social value of the emerging information infrastructure.

2.0 Intellectual Property Right Systems

Systems for granting rights in intellectual property embody and reflect legal doctrines and principles that are particular to the development of legal systems. For example, France developed a particular interest in the idea of protecting the author's right to control the copying and potential modification of their work. By contrast, copyright law in England emerged from a desire to regulate the nature of competition and was endorsed in the United States constitution as a means to "promote the Progress of Science and the Useful Arts."[1] The British and United States' motives of protecting the commercial interests of publishers have been emphasised in economic analyses of copyright law although elements of the French tradition of *droit d'auteur* such as *droit moral* (the moral rights of authors to be identified and to avoid alteration of their work without permission) and *droit de suite* (the right of authors to benefit from the subsequent sales of their work) are a continuing influence in efforts to bring together national systems of copyright protection.

Copyright law grants the creator of particular types of works an exclusive right to control the making of copies, broadcasting, or other forms of distribution of that work to the public.[2] A broadly accepted definition of what constitutes a work is that it includes "every production in the literary, artistic and scientific domain, whatever may be the mode or form of its expression."[3] This definition clearly encompasses much of the information that might be created for distribution in a GII. Its coverage is, however, not quite as universal as the definition suggests; substantial national differences continue.[4] This has led to discussions about the desirability of clarifying existing law in several areas including: a) the protection of databases which may consist of compilations of individual pieces of information that may not be granted copyright individually,[5] b) multimedia works whose components may be copyrighted individually but can be more efficiently protected if the work as a whole is protected, and c) works that may be "transmitted" over a network.[6]

Works must also meet certain standards of originality to qualify for this right. Copyright protects how ideas are "expressed" rather than the ideas themselves, but the line between expression and ideas is often unclear. For example, no-one owns the copyright to the idea of a detective novel but a work that closely copies the plot ideas of a Simenon detective novel may well be in violation of copyright even if no sentence is exactly the same. The line between idea and expression is particularly important for software and multimedia because the innovative character of these works may reside in their "look and feel" to users and because of the relative ease by which a particular "expression" may be modified by the use of software authoring techniques. These problems continue to be active areas of litigation within national copyright systems and thus it is probably too early to attempt a broad new international convention on these issues.

National standards for the protection of IPRs were among the first efforts by European nations to harmonise their legal systems through international agreement. Signatories of the Berne Copyright Convention of 1886 agreed to enforce the copyright of foreign authors according to their own copyright laws and to enact national laws addressing copyright coverage and other issues. The Berne Copyright Convention is monitored by the World Intellectual Property Organisation (WIPO). The Berne Convention was a major step toward harmonisation of European copyright enforcement since it allowed legal action in the country in which a violation occurred regardless of the nationality of the author. Successive agreements during this century have extended the minimum rights granted by The Berne Convention, e.g. for public performances, and the cinema. Its international significance has been enhanced by the recent addition of the United States in 1989 and many developing countries as signatories. At present, the Berne Convention provides a workable international framework for copyright enforcement in the receipt of many of the forms of information that may be made available using information infrastructures.

The Berne Convention does not, however, determine what the level of protection is to be in any particular signatory nation and the existence of relatively weak protection in some non-OECD nations was influential in the establishment of the Trade-Related Intellectual Property Rights (TRIPS) agreement, part of the GATT Uruguay Round agreements. The TRIPS agreement articulates the norms for national law suggested in the Berne Convention and allows for trade sanctions against non-complying nations. For such sanctions to occur, a national complaint must be lodged by a signatory nation with the World Trade Organisation (WTO). From a developing country viewpoint, TRIPS may create exposure to trade sanctions in actions stemming from GII development that are difficult to detect or enforce and thereby create an impediment to the diffusion of information and communication technologies in those countries.

In addition to IPRs in the exchange of information, the development of the information infrastructure will require substantial investments in inventions, the subject of patent law. The grant of a patent gives the applicant the exclusive right to the use of the invention in exchange for disclosing how a person skilled in the art of the patent's subject could understand and work the invention. Patent systems, like copyright systems, originate in national legislation and are increasingly governed by international agreements such as The Paris Convention for the Protection of Industrial Property (1883).[7] Unlike the Berne Convention which dispenses with the formality of copyright application among signatories, the Paris Convention applies only to the rights of foreign nationals to apply for and be granted patents on the same terms as residents of the signatory countries. Although the criterion for granting patents varies among countries, it generally includes an element of novelty, some practical use, and an inventive step (i.e. a step that will not be obvious to a person skilled in the subject matter of the patent).

In the effort to build a European information infrastructure, patents raise two main issues. The first is the use of patents to develop control of a broad area of technology for reaching customers such as the development of "set-top boxes" or other equipment for the receipt of audiovisual and data transmissions. The second is the possibility that equipment developed to upgrade and extend business use of the European information infrastructure may be based on patented technologies that raise entry barriers and reduce competition, reducing the extent of interconnectability and interoperability of the network and thereby defeating the aim of creating a seamless European information infrastructure.

This brief review of IPR systems indicates that there are two basic issues that need to be considered in setting policy in the area of IPR to serve the goal of building information infrastructures need for the information society. The first is the level and nature of copyright protection to be afforded authors and publishers in distributing information over information infrastructures. The second is how to weigh the balance between patent encouragements for innovation in advanced information infrastructure technology and the possibility that the control and effective ownership of this infrastructure might be concentrated and lead to undesirable outcomes. The second of these issues will be dealt with here.

Issues of control and effective ownership of the European information infrastructure are, in the first instance, matters of regulatory policy and these issues are considered in an accompanying report.[8] IPRs may support the extension of this control through either the software or the hardware interfaces that govern interconnection on the information infrastructure. With regard to software interfaces, the existing European software directive provides that an authorised user of a computer program may obtain the necessary information to achieve interoperability of that program with other software while

prohibiting the conduct of this activity for developing, producing or marketing a computer program that is substantially similar in expression. This is a significant limit of copyright protection to achieve social goals of interconnectivity and interoperability in information infrastructures. With regard to hardware interfaces, no similar protection of interoperability exists. This raises a fundamental problem that is addressed by the first of our policy action recommendations.

In modern information and communication technologies, what is embedded in hardware and what is accomplished through the use of software is a matter of design choice. The present European Commission directive on software creates an incentive for producers of information infrastructure to embed interfaces in hardware, where possible, in order to achieve the higher level of IPR protection available through the patent system. This is because current patent law allows interfaces to be patented. Patent protection includes the use of the patented idea in the design of interconnectable or interoperable interfaces. Patent protection has played an important role in the standards process, leading to partial solutions such as patent "grant backs" which endorse the validity of the property right while requiring that it be licensed on a nondiscriminatory basis. The use of hardware patents to control interfaces in the information infrastructure can serve to create "gatekeepers" that fragment or delay the overall progress toward interconnectivity and interoperability. Modifying patent law to support this goal would be a major change with far reaching consequences, but it is one that should be examined if the goals of interconnectivity and interoperability are to be taken seriously.

It is possible that the same effect can be achieved through regulatory control, but this also would be a major step. Regulatory policy can prohibit the use of patent protection to control portions of the European information infrastructure by enacting directives similar to those supporting implementation of Open Network Provision (ONP). This case, however, is more complex as it potentially involves regulating technologies whose interfaces are not yet part of the network information infrastructure and players that are non-European. Nonetheless, it would be possible to devise a threshold test engaging regulatory action when a patented interface technology appears like to have a significant role in the information infrastructure. Thus, the first of our policy action recommendations is:

Recommendation 1:

Interconnection and interoperability are vital in developing the information infrastructure needed by the information society. IPR protection should not provide for higher levels of protection to interfaces implemented in hardware than those currently given for software interfaces. This is likely to require change in patent law. Alternatively, regulatory policy measures should be enacted that have the same effect.

The remainder of this report is devoted to the analysis of the level and nature of copyright protection to be afforded authors and publishers in distributing information over information infrastructures. We begin by outlining the social constituencies benefiting from developments of the information infrastructure and identifying their expectations. We then consider the security issues involved in providing IPR protection to authors and publishers and some of the opportunities and constraints for improving protection. These security issues are then considered in the light of current developments in generating revenue through information services on existing telecommunication networks and the development of the "network of networks" approach uniting formerly unconnected portions of the telecommunication network. Our final section concludes that costs and benefits must be weighted in extending copyright protection and policy action offers recommendations to accomplish this task.

3.0 Social Constituencies in the Information Society

Some guidance as to the motives for the supply of different types of information and for the interest in accessing this information is available from examining the existing collection of publicly accessible information services. These services include Minitel, Internet, other research or university oriented computer networks such as Janet, information service providers such as Compuserve, and services provided by hardware or software companies such as Apple Computer's eWorld or The Microsoft Network. The motives for developing these networks and for supplying information to them include, for example, the explicit aims of contributing to publicly available information, to promoting activities such a research and education, and to generating commercial revenues. Users or subscribers to these networks have a similarly diverse collection of motives for accessing this information and are often suppliers of information themselves when they communicate political, cultural, and social views, share practical information, "post" research results, and offer goods and services for sale. Two striking features that almost all of these systems share is the amount of material that is contributed

without charge and the use of the network to communicate information that would not be subject to copyright. At the same time, existing commercial networks do provide and promote access to information that is subject to copyright and a limited, but rapidly growing, amount of such information may be found on non-commercial networks. These simple observations suggest a closer examination of the motives that producers and users of information have in using such networks and the definition of specific constituencies associated with these uses.

3.1 Three Constituencies

The following sub-section describes the different uses of copyright by three different constituencies of individuals and organisations. The first constituency makes either no use or limited use of copyright protection and is called the “public domain constituency.” The second constituency uses copyright protection to maintain control over the content of works, but benefits from the wide dissemination of copies. The third constituency seeks direct control over who may make a copy in order to be able to sell copies. The use of copyright protection is the defining characteristic of these constituencies. A given organisation or individual may be a member of one, two, or all of the constituencies. The purpose of examining these constituencies is to identify possible conflicts in economic or social interests among these constituencies with respect to copyright protection. When the same individual or organisation has multiple “allegiances” to different constituencies, they may have divided or mixed opinions about how conflicts about copyright protection should be resolved. Society as a whole has an interest in assessing the size and contribution of these constituencies to the information society and in finding ways to resolve conflicts among them.

3.1.1 The Public Domain Constituency

A first constituency of producers of information consists of those who receive a benefit from the dissemination of their work unrelated to their receipt of revenue or income as well as people who simply want to make a contribution. Associated with this constituency are users who are interested in information for both personal and commercial reasons (an example of the latter is the monitoring of publicly disclosed research results to identify commercial opportunities). We will call this the "public domain constituency". A very substantial amount of information now provided on forerunners of the global information infrastructure such as Internet and commercial bulletin board services is noncommercial in nature. The authors of much of this information seek the broadest possible dissemination of their contributions without charging receivers. Examples of members of this

constituency include researchers who wish to share scientific data, individuals wishing to exchange political viewpoints, and teachers who wish to share their insights about education. Both the producer and user portions of this constituency support the inexpensive distribution of public domain information using information infrastructures. Producers within this group often have an interest in copyright protection in accord with *droit moral* so that the content of their contribution remains unaltered and they continue to be recognised as the author of the material they contribute.

While we have emphasised the non-commercial motives of producers in the public domain constituency, the public domain distribution of information has generated commercial opportunities. The most direct commercial returns available from public domain information are realised by information services that charge for access, a group that includes the larger commercial information services as well as an enormous network of bulletin board services which can be organised with a phone line and a modest investment in equipment. In addition, the desire of producers to improve the value of their public domain contributions partially supports the creation of books, magazines, and software devoted to tools for improving the display qualities and usability of public domain information. Users have an interest in discovering useful public domain material which has partially supported a market for guides to information services and the creation of electronic databases to such resources.

3.1.2 The Related Revenue Constituency

A second constituency of information producers share an interest in distributing information without direct payment for the receipt of information but expect the distribution of information to increase their future revenue or income. This group, which we will call the "related revenue constituency" includes businesses that hope information will improve their position with investors, the public at large, and with customers in particular. Such information, which falls in the categories of public relations and advertising, is ordinarily costly for businesses to deliver to their existing or potential customers. Similar advertising and promotional activities are conducted by charitable and nonprofit organisations that rely on voluntary contributions.

At present, there are important differences between the practice of advertising and public relations in information infrastructures and the use of more traditional media such as newspapers, magazines, and particularly in direct mail where study of the demographic characteristics of "target" audiences leads to highly selective and focused strategies for achieving exposure. More sophisticated approaches for exposing individuals to advertising and promotion messages using information infrastructures will emerge quickly and this process will bring with it concerns of the user community with controlling

the receipt of such information. Moreover, since one of the techniques that is attractive is to monitor and analyse individuals using their information service requests and other information about them as individuals, concerns about privacy will become more important among the users in the related revenue constituency.

Innovative uses of existing information infrastructures (including physical exchange of information on discs among individuals and the distribution of discs or CD-ROMs with printed magazines) are being made by the producers of so-called "shareware" computer programs and variants of information products. These producers promote the copying of their products and exhort users to make a financial contribution if they use the product for more than investigation and trial. There are some indications that this strategy does, in fact, lead to commercial returns for some producers.[9] Accompanying the growing interest in shareware is the distribution of "trial" versions of software products. Trial versions are unlike shareware in that they are also limited versions of the full commercial version which is ordinarily distributed through ordinary software retail channels.

Another innovative use of the existing information infrastructures by the related revenue constituency includes companies that offer "post-sales" support to customers such as fixes or upgrades to software products (Digital Equipment Corporation operates one of the world's largest Internet sites for this purpose.) Distribution of this information is a complement to the sale of products and services in which the primary copyright or other contractual protections are established outside the information infrastructure. In rapidly moving product and service markets, this form of connection with customers provides information supporting product improvement and helps to retain customer loyalty, thus contributing to future sales.

These examples do not exhaust the types of activities that commercial enterprises and individuals have employed in seeking related revenues. In general, the related revenue information identifies a connection between the information distribution capabilities of the information infrastructure and their other business activities. Virtually all of the conventional methods for promoting products or customer interest have information infrastructure equivalents including new product announcements, hints and tips for product use, and customer answer lines.

Our definition of the related revenue constituency is meant to highlight the copyright implications of the "related revenue" application of information infrastructure. It establishes a boundary between related and direct revenue that is linked to the *distribution of the product* using the information infrastructure. This is because copyright protection issues are more significant for those companies that use the information infrastructure directly to distribute their product. A category of activity that

bridges the related revenue constituency with the direct sale of products and services *delivered* using information infrastructures is "mail order." Growth in the participation of companies offering mail or other forms of non-infrastructure delivery for products and services has been very rapid, particularly following the liberalisation of the regulations on the commercial use of the Internet. Mail order companies share an interest with those who deliver goods and services using the infrastructure. That interest is in developing means of accepting payment for goods and services through funds transfer methods using the information infrastructure or secure methods of receiving credit card information from users. The IPR implications of these needs, and their consequences for users are discussed below.

The related revenue constituency has a substantial interest in preventing the alteration of the information they provide (e.g. the limitations imposed in trial versions of software) through the use of provisions of copyright protection like the *droit moral* stricture on the "mutilation" (i.e. alteration) of a work. To our knowledge, no court case has yet tested the limits of copyright protection of this type of information distribution. Some of these activities, such as the practice of encouraging users to make copies of shareware to give to others, may raise new legal issues. Although legal tests of copyright protection for many of these activities have not yet occurred, it would be reasonable to conclude for the present that existing copyright rules will prove adequate to defend the integrity of this information from modification and the commercial interests involved in these activities.

Users of information provided by the producers in the related revenue constituency face similar problems of searching and filtering information of value to them as they do when participating in the public domain constituency. This generates demands for guides and directories, and related revenue information producers are often identified in guides to public domain information. It is therefore unclear whether users in this group are distinct at this time from the user constituency using public domain information. In the future, however, these user constituencies may develop more distinct identities corresponding to social differences between individuals that avoid advertising messages and those that seek them out.

3.1.3 The Direct Revenue Constituency

A third constituency of producers and users has interests in selling and buying information goods and services using information infrastructures. Producers in this *"direct revenue"* group need a means of protecting the value of their goods and services from those that would like to receive them without paying. This group is strongly interested in a high level of IPR protection as well as other protections to insure that those who value their products and services will pay to receive them. The markets

created for these goods and services will be based upon: 1) winning a share of the existing markets for information distribution using other media (with information infrastructures eventually being able to deliver audio, audiovisual, and multimedia products), 2) creating new products and services involving information that may be subject to copyright protection but that is, either by choice or by technical limitation, not distributed using other media, and 3) creating new services that may employ the telecommunication features of the network (e.g. videophone services). IPRs are particularly relevant to the first two of these markets. (The discussion of patent protection in Section 2. is relevant to the equipment for the third market.)

The sale of information products and services that may be distributed using other media is reliant upon a number of developments outside of the IPR domain. It is often assumed that the costs of reproducing and distributing information products will fall dramatically when such information is distributed via communication networks. What is often unappreciated in discussions of electronic distribution of information is that the manufacturing costs of creating copies of information embedded in other media are already quite low. For example, in book publishing, the costs of manufacturing the copy is a small fraction of the price paid for the book. Most of the price covers: a) the costs of retailers and distributors who promote, stock, and deliver books, b) the costs of the publisher in promoting the work as well as absorbing losses on copies of books that are not sold, and c) the author. While distribution and unsold inventory costs may be reduced by electronic distribution, some or all of the costs that distributors and retailers now incur in promoting copyrighted works must be covered by publishers or will be received by electronic distributors. Similar considerations apply to compact discs, packaged software (where author and publisher are usually the same), and pre-recorded audio and video tapes.

Thus, information infrastructures will likely continue to compete with other media for distributing copyrighted works such as books and pre-recorded audio or video recordings. This consideration of competition among media for the distribution of information is important to public discussion of IPRs because it helps explain why a very high level of intellectual protection may be sought by publishers as a pre-requisite for choosing to distribute works over information infrastructures. This should not suggest, however, that electronic distribution creates business opportunities that are exactly identical to existing markets. For example, the publishers of academic journals have long sought effective price discrimination methods that would allow them to charge higher prices to libraries and lower prices to individuals. A number of more sophisticated approaches are now becoming available for electronic journals such as "site licenses" at the level of the university or even nationally. Electronic distribution may also allow new business strategies that utilise differences between electronic and physical distribution. For example, the publication of literary works with attractive bindings and

typography is likely to continue even if lower priced copies of the text are made available using information services.

Another important category of information distribution that may employ the information infrastructure is broadcast audio or television programmes. Broadcasts, generally including those made by public broadcasters, are subject to copyright and the rebroadcast or commercial copying of broadcasts is held to be a violation of copyright under international norms such as the Berne Convention which are generally supported by European directives and national copyright laws. If broadcasting becomes part of the information infrastructure, existing problems of copyright protection such as copying of broadcasts for commercial gain will be transferred to the information infrastructure. New problems may also emerge. High performance features of the information infrastructure such as video links may be used to redirect broadcasts or distribute copies of them. Video-on-demand access or content may be misappropriated. Unauthorised access to interactive services may occur.

Effective copyright protection is necessary to allow the information infrastructure to compete with physical distribution, to cope with the problems of electronic distribution of copyrighted broadcasts, and to protect other information that is distributed using the information infrastructure.

In addition to the issue of copyright protection for information distribution, producers and users who wish to exchange goods and services over the information infrastructure are interested in the development of electronic payment mechanisms including credit card entry, validation, and the development of cash transfer methods. The main IPR-related issue in this area concerns the search for effective protection of such payment mechanisms. This process is still at an experimental stage and it is unclear what, if any, mechanism will achieve broad market success. It is likely that a particular payment mechanism will be protected using one or more types of IPR protection and that the value of a broad standard will create a "bandwagon" effect leading to market dominance of that standard. The possible risks to social welfare of such a broad standard are limited, however, by the possibility of competing payment mechanisms. Experience in credit card markets indicates the potential for development of oligopolistic rivalry where profits are constrained by the existence of alternative payment methods. A similar expectation is likely to apply to electronic payment mechanisms in the information infrastructure. It may, nonetheless, be possible for a company to develop an internationally accepted standard for creating cash on the network and to reinforce a dominant position in this market with IPR protection. Such a company might become very large, even though profits on individual transactions would be small (due to competition from other payment mechanisms).

Producers and, to a lesser extent, users in the third "direct revenue" constituency have a unique interest in copyright protection. Both producers and users participating in this constituency have an interest in the development of effective payment mechanisms that afford secure and reliable means to make payments for products and services distributed using the information infrastructure.

3.2 Shared and Conflicting Interests Among the Constituencies

The three constituencies described in the previous section make different use of copyright protection and rely on it in different ways. In addition, producers and users in each of these constituencies have different interests in the effectiveness of copyright protection and vigour of copyright enforcement. Deriving the highest social value from these constituencies' activities will require addressing the shared and conflicting interests among them. An individual or organisation may participate in any one or all three of the constituencies on the information infrastructure. The value of identifying these constituencies is to highlight their different interests in the copyright system.

The primary interest of producers in the public domain sector is in retaining some credit for their work. Since this particular right cannot be protected from a general claim of copyright, many works are truly in the public domain and may be copied, modified, or excerpted without concern by users. It is certainly true that many users voluntarily comply with standards for identifying authorship.

Where the public domain constituency comes into conflict with the other two constituencies is in the production and receipt of material that violates copyright. Suppliers who incorporate copyrighted works without authorisation in their own distributions or users who receive unauthorised copies of copyrighted works are legally liable for the commercial damage that such activities may cause. Similarly, it may be claimed that a particular producer has violated copyright when his or her work is substantially similar in expression to a work that is protected. For obvious reasons, legal defences against copyright infringement cannot be based on inadvertence or ignorance. Thus, raising the level of intellectual property protection and enforcement increases the liability of both producers and users.

As in other sorts of liability issues, the choices are among a) increasing the level of monitoring and avoidance of risk to reduce liability, b) insuring against the risk of liability, c) accepting the risk with the hope of escaping a legal liability judgement, or d) attempting to transfer the liability risk to another party. Each of these choices is now being made by producers and users as well as information service companies participating in the public domain constituency. Making either of the first two

choices directly increases the costs of the public domain constituency. Choosing either of the latter two may lead to higher costs at a later time which will depend on the level of copyright enforcement. In short, there are conflicts of economic interest between the public domain constituency and the other two constituencies.

The conflict between the related revenue and direct revenue constituencies is less direct and primarily involves the consequences of the conflict with the public domain constituency. To the extent that higher levels of protection for copyrighted works raise costs, either directly, or indirectly, in terms of access convenience, the interests of the second constituency will be damaged. Its principle interest is in the easy access to information and cost and convenience are primary determinants of ease of access.

If it is possible to resolve these conflicts by developing a widely accepted and secure means of transferring copyrighted information between producers and customers than all of the constituencies can coexist without conflict. To the extent that reliable and secure methods are unavailable, the interests of the direct revenue constituency will be in conflict with the public domain and related revenue constituencies. In this case, public policy, including policy on copyright protection, must weigh the balance of interests and devise ameliorative solutions. Unfortunately, it appears that the second scenario is the one that will govern in the medium term.

To understand why this is true, it is necessary to examine the relation between copyright protection and security issues. This interaction has two aspects: 1) the security of particular types of information from unauthorised reproduction and 2) the security of the information infrastructure from being used to transmit unauthorised copies. The first aspect takes precedence since a reliable means of securing individual works would assure that all of the costs of such security were paid by those who benefited while the second may impose costs on all users of information infrastructures and therefore sustain the conflicts between the interests of the three constituencies. As the next section explains, neither type of security is widely accepted or effective. This leads to our conclusion that the current enthusiasm for extension of copyright must be examined in terms of social cost as well as social benefit. The recommendations in our conclusion outline the knowledge needed to make this comparison of costs and benefits.

3.3 Security of Intellectual Property Rights On the Information Infrastructure

3.3.1 The Security of Different Types of Copyrighted Information

Information and communication technology systems are designed to transmit and store information, and to do so by creating perfect copies of information at the lowest possible cost. Information infrastructures constructed using these technologies, may therefore dramatically reduce the costs of making identical and unauthorised copies of copyrighted material. Concern about the security of information stored and transmitted over information infrastructures is therefore a central issue in determining whether copyright protection can be realistically expected.

There are several routes to reducing, and perhaps eliminating, security problems in the transfer of copyrighted information. None of these routes is costless, however. Each imposes costs on producers and users that may or may not be necessary depending upon the extent of copyright protection desired by society and enacted into law. To the extent that these costs fall on producers and users that are not in the direct revenue constituency, the conflict of interests among the constituencies remains.

The first route to enhancing security involves the addition of technologies that prevent the unauthorised reproduction of an electronic work that is copyrighted. A number of such technologies have been devised throughout the history of the computer industry and especially during the personal computer era. Computer manufacturers have generally chosen not to implement such technologies, e.g. mechanism for identifying individual machines that would provide means for software producers to embed code in their products linking the copyright license to a particular machine. It is unclear whether this was not done because computers are more valuable with more software (regardless of the legality of its acquisition), the risk of computer users refusing to buy the products of a manufacturer who chose to incorporate such protection, or the technical opinion of computer manufacturers that such devices could be overcome. As a result, hardware-based copy protection methods that have been devised have been "keys," or add-ons. This solution has the desirable feature that it imposes all of the costs of copyright protection on those that benefit from it. As yet, however, only a small number of software products require such a key.

A hardware solution, even if it were to be effective would apply to executable software that could check for the key. Other forms of information distribution, such as the distribution of audiovisual material would require that the "reader" of such software check for the key. A variant of the hardware key, the "master disc" method was attempted for one leading software product (Lotus 1-2-3) and many smaller companies, but this technique proved unpopular with users and was abandoned.

A second route is to embed copy control schemes in the installation software accompanying software packages. Again, this only applies to executable programs and excludes other mechanisms for

distribution of information that might accessible using alternative "readers". Users are also resistant to this technique for a number of legitimate reasons including hardware failures that destroy legitimate copies of software or other information.

A third route is to link users and individual copies of information. This technique requires a user to identify him or herself and receive authorisation codes from the software manufacturer. This technique has been successfully used for expensive software such as that used in mainframe computer installations, but it is costly to administer and may be resisted by users who often have other less cumbersome alternatives. Nonetheless, this technique has been effectively employed in the CD-ROM market where copies of particular programs may be "unlocked" by gaining the appropriate access code. A higher level of protection is available in this market because it is presently expensive to make copies of CD-ROMs and therefore this technique has some similarity with the "master disc" approach. However, if users are able to copy the information from the CD-ROM, the additional cost and inconvenience of periodic renewal of authorisation codes may be necessary. This technique can be used over information networks if the key is linked to a individual copy of the program which requires that producers devise methods for customising the identity of every downloaded program. The only means around this method is to devise fraudulent identity codes which are accepted as valid.

Other technologies may emerge in the future that are not variants of the three existing routes. Until either a major innovation appears or user acceptance of one or more of the three existing approaches is won, there will be no broadly effective mechanism for safeguarding IPRs in software or other data distributed among personal computers. This also applies when the distribution method used is the information infrastructure. Outlawing the distribution of information about how protection schemes are implemented (so that others may more clandestinely overcome them) and how they may be defeated (for those that have a motive to spend the time and effort to do so) may be relevant to the third route where it would be useful to sanction "services" for creating unauthorised codes. Such enforcement rules may be difficult to implement given issues of freedom of expression in many countries.

The absence of a broadly accepted standard for copy protection in the personal computer world does not foreclose the possibility that hardware or software based protection schemes may become available for other equipment used on the information infrastructure. Although it is often repeated that the existence of technological means for capturing reproduction of a stream of bits is sure to defeat any hardware scheme, these means must be distributed directly to willing users for some types of information (e.g. audio or television broadcasts). For other types of information –e.g. copy

protected software—the technology must be delivered to "pirates" who are prepared to violate copyrights on a sufficient scale to make the purchase of the technique worthwhile. Both of these alternatives suggest target enforcement efforts that are similar to existing campaigns against the infringing copying of game machine cartridges or compact discs.

In the absence of a highly reliable technological method for copyright protection, attention must turn to methods that seek to discourage rather than to eliminate copyright violation. The main response is to remove, to the extent possible, the profit from violating copyrights. This requires a means of seeking out large scale copyright violation operations.

A starting point for discouraging large-scale copyright violation operations is to include methods for labelling individual copies of software and other types of information so that it is possible to discern the provenance of a copy. This technique, accompanied by a registration procedure, offers a method for detecting the legitimate owner of any copy. The inspection of copies for which the user cannot demonstrate authorised use would create a presumption that copyright violation had occurred. Enforcement alternatives, once such a discovery is made, raise difficult legal and practical problems and thus are only practical for pursuing large scale copying operations or organisations that use many copies of software. Preventing the elimination or modification of such identifying marks by encryption techniques provides further assurance that the original copy can be identified.

Marking techniques and registration procedures require some user cooperation which may be encouraged through a mixture of encouragement and warning. Efforts to make these procedures as convenient and cheap for authorised users as possible will further aid in their acceptance. These techniques may reduce the risks of wholesale copying sufficiently that some of the advantages of the information infrastructure for copyrighted information may be explored and compared with the existing problems of copyright protection in physical information distribution.

At present, there are no broadly accepted standards for reliable copy protection of software and other information that may be distributed over the information infrastructure. What can be done in the security domain is to improve methods for identifying the provenance of information and encouraging users to cooperate with the use of registration procedures for a growing array of copyrighted work. It is often maintained that the extent and rapidity at which damage that can be done to the commercial interests of the owner of information makes the highest possible protection necessary. However, it is also true that, if such a level of protection increases the costs of legitimate transactions or abridges the value of the information to users after receipt, such a standard may not be in the interest of either party. In fact, this may be the primary reason, that available techniques have not been accepted. This

principle is illustrated by experience in the personal computer software market where available technological solutions are largely unimplemented.

If one accepts that the costs of protection should be paid by those that benefit, then it would seem to follow that members of the public domain and related revenue constituencies should not have to make a financial contribution to these costs. The argument that the present costs of copyright protection should be imposed on producers and users of copyrighted information may, however, be too narrow. There is social value in building the information infrastructures needed for the information society. Since much of the expenditure on such information infrastructures is a fixed cost, the addition of more users has the potential to reduce the costs to all users. This suggests that the public as a whole should support research to improve protection methods due to their broad applicability in the information society.

Given present trends in the development of security and encryption devices it is likely that existing methods of protection will be improved though they will continue to fall short of the stringent levels of protection sought by the "direct revenue" constituency. In the absence of broadly accepted and effective methods for copy protection, it is necessary to consider how copyright violation using the information infrastructure can be reduced or eliminated. As noted earlier this will involve balancing the interests of the three constituencies.

3.3.2 Controlling Copyright Infringement Uses of the Information Infrastructure

The current components of the information infrastructure, telecommunication, cable, broadcast microwave, and cellular networks, support commerce and trade. As the capabilities of these networks are enhanced, and with the possibility that they may converge to a common digital format, existing uses such as the provision of information services for data communication will be adapted to the new environment. Moreover, because the costs of enhancing the capabilities of existing telecommunication networks will be considerable there is substantial interest in how they may be used to generate new sources of revenue generated by information distribution and thus justify new charges to users.

The use of the telecommunication infrastructure to generate revenue from the distribution of copyrighted information is one of the many new revenue generating activities that will help to pay for the costs of enhancing that infrastructure. Some customers of the information infrastructure will be willing to pay for higher access and service charges to obtain an enhanced connection that will allow them to receive copyrighted information in audiovisual, audio, still image, and computer file formats

for business, social, entertainment, and educational purposes. Moreover, cross-subsidisation of these enhanced services from other users is likely given the imperfectly competitive markets that characterise some segments of the information infrastructure.

It is unclear what new forms of equipment will emerge to take advantage of these enhanced connections. Extensive copyright infringement using the network requires a network architecture that supports the straightforward storage or retransmission of information received by users. Some new equipment may not support this application either by manufacturer or public choice. However, if we confine our attention to the sort of information that is distributed presently over networks which support personal computers, transfer of copyrighted information is possible because of the problems with security mechanisms noted in the previous section. Current trends in the use of data communication systems provide some insight into the nature of the interaction between copyright, security, and architectural issues

Existing international uses of telecommunication networks for data communication have grown from two "root systems". The first, originating in the academic and public sector, has focused on the dissemination of information and the reduction of the costs of communication in the conduct of research and the performance of public functions. In this system, the main goal is to create the least expensive and least restrictive means of accessing and distributing information that is possible.[10]

The second “root system” supporting the growing use of advanced telecommunication services is the commercial activities of business. Business use of telecommunications has been most sophisticated within the boundaries of firms where telecommunication systems are part of the coordination and control infrastructure that make the business a distinct social organisation. Much of the information flowing over communication links within a business is regarded as proprietary since its dissemination to competitors may put the business at a disadvantage. Thus businesses weigh telecommunication issues in terms of both costs and control of information, and this is most evident in sectors such as banking where advanced services and data applications have been slow to be introduced in areas such as risk assessment and approvals of lending arrangements. Reducing costs cannot be pursued without consideration of the possibility of losing control of information flows.

Despite the different origins of existing data communication systems there are means of bridging different parts of the network together. The idea that this can be extensively and effectively done is incorporated in the "network of networks" concept which makes extensive use of public and private telecommunication networks. Public Telecommunication Operators have established their own standards for such interconnections to allow the flexible interconnection of new capacity within their

own systems and to enable the interconnection of systems that they do not directly control. They have also allowed, or been forced, to accept a broader set of interconnections of their own infrastructures with those of other commercial enterprises who may compete with them or buy less of some of their services as the result of this ability to interconnect. An important distinction made throughout this process is between interconnection and content. As a consequence, Public Telecommunication Operators, are generally not held to be responsible for the information that flows over their networks, including information that is in violation of copyright. Departing from this tradition would be a bad idea as it would offer further incentives for these operators to seek ways of profiting from information and its recombination that is generated by transaction over the networks. The privacy consideration and regulatory requirements would be extensive.

The two “root systems” contributing to the development of data communication methods are coming together with cable television and other forms of information transmission in the "network of networks" approach. This process of integration, however, is not yet complete. The two main reasons for this is that present networks incorporate a wide range of technical standards for interconnection and the two main root systems of data communication networks have different approaches to security issues.

Business telecommunication systems are largely based on proprietary standards that will be retained for some time to come because they have attractive performance characteristics and a large installed base. In the longer run it is possible that a new high performance standard will prevail against other older systems, e.g. ISDN (Integrated Services Digital Network) standards may prevail in relation to IBM’s proprietary Systems Network Architecture (SNA) standard, DEC’s DecNet standard, etc. However, this has not yet occurred.

In the meantime the network of networks approach in business telecommunications is based on methods of knitting together proprietary standards with bridges and converters located inside businesses or services on the networks called Value Added Network Services. This approach has the desirable feature that it preserves technological differentiation and encourages competition among suppliers, one factor that is responsible for high performance and quality business telecommunication systems.

The research community has pioneered a second approach to the network of networks problem approach by finding a common denominator with which virtually all existing systems can comply. In doing so, this approach bridges technological variety by reducing some elements of technical performance. The implementation of this approach that has received broadest acceptance is the

Internet which is based on a public standard, the TCP/IP protocol.

The Internet has been enormously influential as a model for the development of the information infrastructure. It already offers a practical means of interconnecting computers that has attracted millions of users. Moreover, this system has been tested for a wide variety of information transfer needs over the past thirty years. To many users the Internet appears to be very inexpensive. This is because substantial public expenditures are made in supporting its use for education and research. The Internet is currently subject to congestion, and will become more congested with the addition of higher capacity information exchange which will lead to higher costs and the need to increase public funding or direct user charges

Despite its popularity, the Internet faces serious problems in the area of copyright protection because of security issues. The Internet is seen by many business information system managers as hazardous to company security and many such enterprises have constructed "firewalls" to separate corporate networks from the Internet. Such "firewalls" have been constructed not only to prevent the loss of control over proprietary information (including liability for copyright infringement) but also to prevent importation of viruses and the occurrence of other security problems such as service interruptions or thefts of service.

Significant improvements in Internet security for business use, including limiting legal liability from distribution of unauthorised copyrighted works, will require security features such as user monitoring and authorisation like those in the business sector. This will increase its costs to the public and users. It will also raise important issues about privacy (user monitoring of electronic mail) and democratic protections (who will do the monitoring). Since the Internet is a major resource for the public domain constituency, it remains to be determined who will pay for these increased costs and to what extent this particular path to constructing the information infrastructure will be accepted. Thus, the conflict between the public domain and direct revenue constituencies in the use of the infrastructure is likely to continue.

4.0 Conclusions

The absence of a broadly accepted and reliable technological solution along with the problems of increasing security in the use of information services based on the use of the Internet will bring the interests of the “public domain” and “related revenue” producer and user constituencies into direct conflict with the interests of the “direct revenue” producer constituency. With growing exposure to

problems of copyright infringement, pressures to limit broad public access to extensive public networks within the "network of networks" may grow. Alternatively, these networks may be subject to increasing user monitoring and security procedures, increasing costs and compromising user privacy. In either case, it will be important for policy makers to know what is being lost in increasing copyright protection and what might be gained by doing so. This is the basis for our second policy recommendation.

Recommendation 2:

Develop means to monitor the impact of efforts to achieve IPRs protection on the operation of data communication networks distributing public domain information such as those used in research communities, the effect of efforts to protect intellectual property on the availability of public domain information and user privacy, and the size of the existing and potential market for copyrighted works distributed over the information infrastructure.

In weighing policy choices that will have a negative impact on one or another of the three constituencies it is necessary to have some idea of their size and activity. This is the basis of our third policy action recommendation.

Recommendation 3:

Develop means to monitor the use of existing information services to ascertain the growth of "public domain", "related revenue", and "direct revenue" constituency activities as an input into policy deliberations about strengthening copyright protection or increasing the security of public and private networks.

The two above policy action recommendations are based upon the continuing failure to develop a broadly accepted and reliable means of copyright protection for information distributed over public data communication networks and other parts of the information infrastructure. The seriousness of this problem would be reduced if available protection means were adopted. The failure to adopt them raises questions about the seriousness of the need for strengthening copyright protection or enforcement to protect IPRs of the "direct revenue" and " related revenue" constituencies. This

suggests a fourth policy recommendation:

Recommendation 4

Examine the effectiveness of copyright registration systems, the opportunities for public support of research to develop effective copy protection schemes that are broadly acceptable to both producers and users, and the reasons that existing copy protection schemes are not broadly utilised in all of the media relevant to the information infrastructure.

It is likely that the European Union will face continuing pressure from the "direct revenue" and "related revenue" constituencies for the strengthening and harmonisation of copyright legislation. It is also likely that the diffusion of reliable technical means of securing such rights will be slower than some advocates of technical solutions have forecast and that these technological solutions will spread unevenly across and within different sectors. The slowness and unevenness of this process is to be expected because the three different constituencies have varying incentives to invest in technical solutions and because of highly differentiated patterns of user acceptance for cultural, social, and economic reasons. This report argues that the costs and other consequences of alternative methods for copyright protection, such as user monitoring and other security-related measures, will diminish the accessibility of "public domain" information. "Public domain" information contributes more to the information society than is often recognised by the other two constituencies.

Conflicts exist among the constituencies over the goals and control of production, distribution, and use of information. Policy makers must distinguish between the rhetoric and practice of these constituencies, which will require more accurate and complete accounts of the implementation of existing IPR legislation and of the use of existing information infrastructures in Europe. The cohesion and social and economic viability of the European information society will be strengthened or weakened as a result of the way conflicting interests in the domain of IPR are negotiated and resolved on existing and future information infrastructures.

Notes and References

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[3] The Berne Convention Article 2(1) as quoted in V. Porter, "Adding Up the Bits: Promoting the Progress of Science and the Useful Arts on the Information Highway," Presented at the PICT International Conference on The Social and Economic Implications of Information and Communication Technologies, London, 10-12 May, 1995.

[4] See Commission of the European Communities, "Green Paper on Copyright and the Challenge of Technology: Copyright Issues Requiring Immediate Action," COM (88) 172 Final, 7 June 1988, pp. 45-53 for an enumeration of specific gaps in existing national laws.

[5] For example, compilations (e.g. digests of facts) are not necessarily covered under the Berne Convention (discussed in text below). Print compilations have been protected by certain nations and not in others. In Europe, the Commission has proposed that electronic compilations be protected from unauthorised "extraction" in Commission of the European Communities, "Proposal for a Council Directive on the Legal Protection of Databases" COM (92) 24 final - SYN 393, Brussels, 13 May 1992 and "Amended Proposal", COM (93) 464 final - SYN 393, Brussels, 4 October 1993.

[6] On these latter points see Commission of the European Communities, "Green Paper on Copyright and Related Rights in the Information Society" COM (95) 382 Final, Brussels 19 July 1995, U.S. Information Infrastructure Task Force, *Intellectual Property and the National Information Infrastructure: The Report of the Working Group on Intellectual Property Rights*, 1995, Section I.A.9., "International Implications", pp. 130-154, and Japanese Institute of Intellectual Property, *Predicted Problems and Possible Solutions for Administering Intellectual Property Rights in a Multimedia Society*, Tokyo, June 1995.

[7] Bainbridge, *op cit*, p. 255.

[8] Robin Mansell and W. Edward Steinmueller, *Policy Options for the New Telecommunications*, Final Report, STOA Programme of the European Parliament, 17 October 1995.

[9] L. Takeyama, "The Shareware Industry: Some Stylised Facts and Estimates of Rates of Returns," *Economics of Innovation and New Technology*, 3(2), 1994, pp. 161-172.

[10] Only a portion of the activities of the academic and public sector is engaged in such public dissemination activities; their other uses of data communication networks may be similar to those of the business constituency.