
# Copyright in the Digital Era: Building Evidence for Policy

ISBN
978-0-309-27895-9

85 pages
6 x 9
PAPERBACK (2013)

Stephen A. Merrill and William J. Raduchel, Editors; Committee on the Impact of Copyright Policy on Innovation in the Digital Era; Board on Science, Technology, and Economic Policy; Policy and Global Affairs; National Research Council

# COPYRIGHT IN THE DIGITAL ERA

## Building Evidence for Policy

Committee on the Impact of Copyright Policy on Innovation in the Digital Era

Board on Science, Technology, and Economic Policy

Policy and Global Affairs

Stephen A. Merrill and William J. Raduchel, *Editors*

NATIONAL RESEARCH COUNCIL
*OF THE NATIONAL ACADEMIES*

THE NATIONAL ACADEMIES PRESS
Washington, D.C.
**www.nap.edu**

**THE NATIONAL ACADEMIES PRESS 500 Fifth Street, NW Washington, DC 20001**

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This study was supported by Contract/Grant No. 2009-10-15 between the National Academy of Sciences and the Alfred P. Sloan Foundation; Contract/Grant No. ll05-0789 between the National Academy of Sciences and the Ford Foundation; Contract/Grant No. LG-00-10-0247 between the National Academy of Sciences and the Institute of Museum and Library Sciences; and Contract/Grant No. SMA-l014801 between the National Academy of Sciences and the National Science Foundation. Additional funding provided by the American Chemical Society; the Business Software Alliance; the Entertainment Software Association; Google Inc.-Tides Foundation; Intel; Microsoft; the Motion Picture Association; and Pamela Samuelson and Robert J. Gulshko. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the authors and do not necessarily reflect the views of the organizations or agencies that provided support for the project.

International Standard Book Number 13: 978-0-309-27895-9
International Standard Book Number 10: 0-309-27895-3

Limited copies are available from Board on Science, Technology, and Economic Policy, National Research Council, 500 Fifth Street, NW, W547, Washington, DC 20001; 202-334-2200.

Additional copies of this report are available for sale from the National Academies Press, 500 Fifth Street, NW, Keck 360, Washington, DC 20001; (800) 624-6242 or (202) 334-3313; http://www.nap.edu/.



Printed in the United States of America

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# Preface

After 10 years studying the economic and research impacts of the patent system, it was apparent to members of the National Academies' Board on Science, Technology, and Economic Policy (STEP) that another intellectual property regime, copyright, exhibited similar characteristics. Over the course of several decades, copyright protection has been extended and strengthened through legislative changes occasioned by national and international developments. The domestic industries reliant on copyright and its exceptions, and in some cases balancing the two, have become more important economically as sources of growth, high-paying jobs, and exports. And these industries have undergone a technological revolution that raises questions about the feasibility of some types of copyright protection, how incentives for content creation, distribution, and use are changing, and the copyright system's impact on technological innovation.

Unlike the patent system, however, copyright has not historically attracted the same level of research interest and effort that helps inform public policy choices. As a result, copyright debates are poorly informed by objective data and empirical research. The STEP Board concluded that in these circumstances a useful step would be to develop an agenda for empirical research on copyright in the digital era, explore its feasibility primarily in terms of data requirements, and encourage public and private research funders to pursue it.

The STEP Board is not the first Academy committee to recognize the need for empirical research on the effects of copyright. In its 2000 report,

*The Digital Dilemma: Intellectual Property in the Information Age,* the Computer Science and Telecommunications Board recommended that:

> Research should be conducted to characterize the economic impacts of copyright. Such research might consider, among other things, the impact of network effects in information industries and how digital networks are changing transaction costs.

And further,

> Research should be initiated to better assess the social and economic impacts of illegal commercial copying and how they interact with private noncommercial copying for personal use.

Despite this call, in the intervening 13 years, only very modest progress has been made.

The Academies sought diverse and balanced public and private funding for the project. Two federal government agencies, two philanthropic institutions, a scientific society publisher, three industry trade associations, three corporations, and two individuals responded generously. The Academies are grateful for support from the following:

National Science Foundation
Institute of Museum and Library Services
Alfred P. Sloan Foundation
Ford Foundation
American Chemical Society
Business Software Alliance
Entertainment Software Association
Motion Picture Association of America
Google Inc.-Tides Foundation
Intel
Microsoft
Pamela Samuelson and Robert J. Glushko

The Chairman of the National Research Council appointed a committee including economists, legal scholars, individuals with expertise in the film, music, publishing, software, and social networking industries, an author, a university librarian and publisher, and a Federal District Court judge. The Research Council's Governing Board Executive Committee presented the committee with the following charge:

> An ad hoc committee under the auspices of the National Academies' Board on Science, Technology, and Economic Policy (STEP) will evaluate and propose how to expand and improve research on the impacts of copyright policy, particularly on innovation in the digital environment.

> First, the organizing committee will identify key issues for and methods of investigation and the experts best able to address them. The committee will also commission a small number of background papers. Second, the committee will convene a multi-disciplinary workshop with experts in the field. Third, following the workshop, additional experts will be invited to comment on the ideas and proposals discussed at the workshop via the project's public website. Fourth, the committee will prepare a final report assessing the current state of the research field, identifying policy-relevant research questions that need attention, suggesting how to approach these topic and recommending how public agencies and private institutions might support such work.

In the course of preparing this report, the committee met three times. At two of these meetings, presentations were made by individuals from government and the private sector. The committee commissioned four original background papers that are summarized in this report. These papers were discussed in an online forum and with invited participants in a public workshop in Washington, DC, on June 8, 2011, at which the newly appointed Register of Copyrights, Maria Pallente, made opening remarks. The June 2011 workshop consisted of two parts: a facilitated discussion with approximately forty invited legal scholars, economists, government officials, and representatives of content owners and civil society organizations; and a more unstructured discussion with a larger group of respondents to a public announcement. The first part of the workshop was instrumental in helping to formulate the framework of research questions and data needs described in this report, both of which were further elaborated in the broader exchange and in the committee's deliberations. For logistical reasons the online discussion preceded rather than followed the workshop and focused entirely on the commissioned paper drafts.

One other observation about the committee's statement of work is in order. In addition to suggesting research topics and methods, we offer research funding organizations guidance about coordinating their efforts, consulting with investigators on data priorities, and assisting in data acquisition. We make no recommendations about the process of awarding research grants nor about the scale of investment needed.

The papers listed below were commissioned by the committee and are available on the Academy website at http://sites.nationalacademies.org/PGA/step/copyrightpolicy/index.htm#papers:

- "The Impact of Digitization on Business Models in Copyright-Driven Industries: A Review of the Economic Issues" by Lisa Cameron and Coleman Bazelon, The Brattle Group
- "Economic Effect of Copyright: The Empirical Evidence So Far" by Christian Handke, Erasmus University, The Netherlands

"Online Access and the Scientific Journal Market: An Economist's Perspective" by Mark J. McCabe, University of Michigan

"Copyright-Protected Assets in the National Accounts" by Rachel Soloveichik and David Wasshausen, Bureau of Economic Analysis, U.S. Department of Commerce

A fifth paper, by committee member Joel Waldfogel, University of Minnesota, was not commissioned by the committee but was presented and discussed along with the four papers listed above and is available on the website:

"Bye, Bye Miss American Pie? The Supply of New Recorded Music Since Napster"

The committee is grateful to these authors, whose backgrounds are described in Appendix B, and their supportive organizations for greatly contributing to our understanding of the copyright system, its economic and technological context and effects, and the limits of our knowledge about these phenomena.

The committee discussed its conclusions and prepared its recommendations at a final meeting hosted by the Berkeley Center for Law and Technology. We appreciate the assistance of the Center's executive director, Robert Barr, and staff.

This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the National Academies' Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the process.

We wish to thank the following individuals for their review of this report: Jonathan Band, Georgetown University; Rob Chandhok, Qualcomm; Carol Corrado, The Conference Board; Peter DiCola, Northwestern University; Daniel Edelstein, IBM; Joan Feigenbaum, Yale University; Shane Greenstein, Northwestern University; Christian Handke, Erasmus University, Rotterdam; Ian Hargreaves, Cardiff University, Wales; Joe Karaganis, American Assembly of Columbia University; Stan Liebowitz, University of Texas-Dallas; Michael Nelson, Georgetown University; Marybeth Peters, Oblon, Spivak, McClelland, Maier & Neustadt, L.L.P.; Charles Phelps, University of Rochester; Dan Rubinfeld, University

of California, Berkeley; Scott Teissler, Turner Networks, Inc.; Don Waters, The Andrew W. Mellon Foundation.

Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations, nor did they see the final draft of the report before its release. The review of this report was overseen by Joe Cecil, Federal Judicial Center, and William Press, University of Texas at Austin. Appointed by the National Academies, they were responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution.

# Contents

# Summary

Over the course of several decades, copyright protection has been expanded and extended through legislative changes occasioned by national and international developments. The content and technology industries affected by copyright and its exceptions, and in some cases balancing the two, have become increasingly important as sources of economic growth, relatively high-paying jobs, and exports. Since the expansion of digital technology in the mid-1990s, they have undergone a technological revolution that has disrupted long-established modes of creating, distributing, and using works ranging from literature and news to film and music to scientific publications and computer software.

In the United States and internationally, these disruptive changes have given rise to a strident debate[1] over copyright's proper scope and terms and means of its enforcement—a debate between those who believe the digital revolution is progressively undermining the copyright protection essential to encourage the funding, creation, and distribution of new works and those who believe that enhancements to copyright, are inhibiting technological innovation and free expression.

This debate is poorly informed by independent empirical research.

[1]The recent report of an informal group of copyright legal scholars and private practitioners used much stronger language, characterizing public discussion of copyright as exhibiting "rhetorical excess," a "climate of recrimination," and "an unwillingness to engage in rational discourse." Pamela Samuelson, "The Copyright Principles Project: Directions for Reform," *Berkeley Technology Law Journal* 25: 2010, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1851857.

Although copyright law's efficacy and second order effects are largely empirical questions amenable to systematically collected data subject to transparent analytical methods, this type of analysis is too rarely conducted. Instead of asking, "What is the research-based evidence?" partisans tend to rely on claims of and evidence marshaled by stakeholders. This situation contrasts with the emerging pattern in patent policy discussions, where empirical research has begun to play an important role in the genesis and resolution of important policy changes and whose support is becoming institutionalized.

Not all copyright policy questions are amenable to economic analysis. In some cases, it may be possible to determine only the direction of the effect of policy changes, not the magnitude. Nevertheless, a robust research enterprise, supported by public and private funders and using a variety of methods—case studies, international and sectoral comparisons, and experiments and surveys—can inform copyright policy by addressing a range of questions. The research we call for is especially critical in light of digital age developments that may, for example, change the **incentive** calculus for various actors in the copyright system, impact the **costs of voluntary copyright transactions**, pose new **enforcement** challenges, and change the optimal **balance** between copyright protection and exceptions.

With respect to changing *incentives* for creators, distributors, and users, research could help determine

- how the expenses involved in creative expression and distribution differ across sectors and the role of copyright in generating revenues to offset those expenses;
- under what circumstances sources of monetary and/or non-monetary motivation outside of that provided by copyright are effective in motivating creative activity;
- the motivations of various types of users and potential users of creative works, including both infringers and lawful users; the effects of enhanced enforcement remedies on promoting creativity, technological innovation, and freedom of expression; and
- how the costs of distributing creative content are affected by social media and other new technologies.

With respect to the enablers of and impediments to *voluntary licensing transactions* in copyrighted works, research would help determine

- the significance of transaction costs as barriers to utilization of copyrighted works;
- the extent of problems involving orphan works (whose owners

cannot be identified), user-generated content, and collaborative and iterative works;
- what are successful arrangements for managing transaction costs;
- the roles of public and private institutions in facilitating licensing;
- the relationship of transaction costs to legal rules such as compulsory licenses; and
- changes in transaction costs with new technological and business developments.

With respect to the *enforcement challenges*, research could help determine

- how much is spent by governments and private parties on copyright enforcement;
- against whom enforcement efforts are targeted and what remedies are sought and granted;
- the results of enforcement efforts in terms of compensation, prevention, education, and deterrence;
- how the effectiveness of enforcement efforts is changing with the expansion of digital networks;
- the costs and benefits of current enforcement methods vis-à-vis those associated with proposed new enforcement methods;
- the relative vulnerability of different business models to infringement; and
- the costs and benefits of fair use exceptions and the Digital Millennium Copyright Act (DMCA) safe harbors.

In assessing the *balance* between copyright protection and the statutory exceptions and limitations to copyright research could help determine

- the costs and benefits of copyright exceptions and limitations in terms of the economic outputs and welfare effects of those individuals, businesses, educational institutions, and other entities that rely on them;
- how copyright and the various categories of limits and exceptions interact with innovative and/or disruptive technologies and platforms; and
- what adverse effects, if any, exceptions and limitations have on copyright holders and their potential to generate economic outputs and welfare effects.

Eventually, research will help inform decisions about key aspects of copyright policy, including

- the appropriate scope of copyright protection;
- the optimal duration of the copyright term;
- the best arrangements for correcting market imperfections that inhibit voluntary licensing;
- appropriate safe harbors and fair use exceptions to copyright;
- effective enforcement remedies for infringing use and the best arrangements for correcting deficiencies in enforcement mechanisms;
- the advisability of reintroducing a formal registration requirement; and
- the advantages and disadvantages of reshaping the copyright regime with different rules for different media.

A precondition of good empirical studies is the availability of data across the principal content media on such matters as the costs of production, marketing, and distribution; prices of products and quantities sold; ancillary sources of revenue for creators; consumption behavior; patterns of access including unauthorized access to copyrighted works; licensing terms and the efficacy of licensing arrangements; and the costs and efficacy of anti-piracy technologies and legal enforcement areas.

Collecting, organizing, and making such data amenable to systematic research represents a considerable challenge. Government-collected administrative data, although important and subject to improvement, are far more limited in the copyright than in the patent arena.

It is encouraging that the digital revolution, while transforming the conditions underlying the copyright system, also means that a wealth of information relevant to the functioning of the system is generated and stored routinely in the course of business—for example, purchases, licensing transactions, and website views among others. On the other hand, data about the creation, consumption and distribution of digital media reside largely in the hands of private entities whose incentives diverge from those of investigators. The first task of public and private grant-making organizations should be to cooperate in building a copyright data infrastructure by negotiating access to privately held high priority datasets, and financing their acquisition costs, where necessary.

The federal government can incrementally improve data collection from businesses and consumers by adding copyright-related questions to the regular surveys conducted by the Bureau of Labor Statistics and Census Bureau and by encouraging donations, for example to the Bureau of Economic Affairs, of private sector business data. But the committee recommends consideration of a more ambitious approach. These agencies, together with the National Science Foundation, U.S. Patent and Trademark Office, and Copyright Office should study the advisability and fea-

sibility of a regular systematic survey of businesses' acquisition and use of intellectual property of all types—copyrights, patents, and trademarks. We also recommend consideration of a companion consumer survey to acquire information on user-generated digital content and consumption of digital goods.

The robust empirical research undertaking envisioned by this report should identify both the costs and benefits of different types and levels of copyright and other forms of intellectual property, and carefully distinguish the various impacts of policy options on different stakeholder groups—creators, developers, distributors, and consumers.

# I

# Introduction

## RESEARCH IN PUBLIC DISCOURSE ON INTELLECTUAL PROPERTY

Congress recently considered legislation, supported by producers of movies, music, software, publishers, and some groups of artists, to curb online piracy of copyright-protected materials by offshore websites located in territories lacking robust copyright enforcement mechanisms. As it neared action on the floor of the House of Representatives, the Stop Online Piracy Act (SOPA) provoked a wave of protest from technology companies, public interest groups, and consumers who asserted that the anti-piracy measures would stifle domestic creativity, freedom of expression, entrepreneurial activity, and innovation. They also raised concerns about online privacy and security. Sponsors of SOPA and the Senate's version of the legislation, the Protect Intellectual Property Act (PIPA), retreated from their support of the bills while still claiming that more effective copyright enforcement is necessary to protect industries vital to the nation's culture and economy. A few weeks later, unrelated legislation, the Research Works Act, HR 3699, supported by commercial scientific publishers, to bar federal research agencies from requiring open access to published research supported by federal funds, prompted similar opposition. Again, sponsors withdrew their support.

The strident debate over the appropriate role of copyright regulation in the digital environment is not limited to the United States. Anti-piracy provisions in the Anti-Counterfeiting Trade Agreement (ACTA) and the

Trans-Pacific Partnership (TPP) Agreement are under close scrutiny and criticism in the European Union and other regions of the world.

These controversies highlight a sharp division between those who believe the digital revolution is progressively undermining the copyright protection essential to encourage the funding, creation, and distribution of new works and those who believe that proposed enhanced enforcement measures could inhibit creativity, technological innovation, and freedom of expression.

Despite these legislative impasses, the past several years have witnessed considerable activity in inter-industry compacts aimed at addressing the challenges of online copyright enforcement. In 2007, leading Internet and media companies promulgated Principles for User Generated Content (UGC) Services that have fostered the development of Web 2.0 services while combating infringing distribution of copyrighted works. Although Google did not formally sign on to this accord, the ContentID technology that it implemented in YouTube's UGC portal reflects the UGC Principles. In June 2011, major credit card companies and payment processors—American Express, Discover, MasterCard, PayPal, and Visa—reached an agreement to develop voluntary best practices to withdraw payment services for sites selling counterfeit and pirated goods. The following month, a group of major Internet Service Providers (ISPs)—SBC, AT&T, Comcast, Verizon, CSC, and Time Warner Cable—and leading content industry organizations—the Recording Industry Association of America (RIAA) and the Motion Picture Association of America (MPAA)—entered into a memorandum of understanding to implement a flexible Copyright Alert System to discourage infringing distribution of copyrighted works. In May 2012, the Association of National Advertisers and the American Association of Advertising Agencies issued a joint statement of best practices to address online copyright infringement. Although some may doubt the merits of these agreements, other privately negotiated arrangements will continue to emerge as new technologies make access, use, re-use, and distribution of content an inherent part of our culture and economy.

The scope and enforceability of copyright protection has substantial consequences for the nation's culture, research enterprise, economy, trade balance, and international influence. Although copyright law's efficacy and contours are amenable to empirical inquiry, systematically collected evidence using transparent analytical methods has not often been brought to bear. When data are marshaled and presented in copyright debates, it is usually by or on behalf of a certain set of stakeholders without opportunities for critical review—for example, many of the estimates of economic losses from infringing use of copyrighted materials, as well as estimates of the economic value of fair use enterprises. And, unfortunately, support

for independent analysis as well as public interest advocacy has declined as a number of philanthropic foundations have scaled down programs in the field of copyright.

This contrasts to a considerable degree with the emerging pattern in patent policy debates. Over the last 20 years, a fairly robust research enterprise has developed, aided by efforts to make patent applications, patent litigation, and related data available in a form usable by researchers. This body of work has examined how firms in industries as different as semiconductors and biotechnology acquire and use patents, how government examiners in the patent office review and act on patent application claims, how the patent system affects different classes of patent users ranging from entrepreneurs to universities and large multinational businesses, and how patent validity and infringement disputes are handled by the courts and in post-grant challenge proceedings (Cohen and Merrill, 2003).

Empirical research on patents, some of it cross-national as well as across industries, spans the social science disciplines, is increasingly common in legal scholarship, and in various ways is becoming institutionalized. It is a principal focus of the innovation and productivity program of the National Bureau of Economic Research (NBER), which created and maintains the largest patent database tailored to research purposes (Griliches, 1990). Research projects related to patents have been among the portfolio supported by the National Science Foundation's Science of Science and Innovation Policy Program (SciSIP) since its inception in 2005. And in 2008 the U.S. Patent and Trademark Office (USPTO) created the Office of Chief Economist to promote and conduct a wide range of research on the management and effects of the patent system, following a recommendation of the National Academies and the examples of the European Patent Office (EPO) and World Intellectual Property Organization (WIPO).

Research on the patent system has not eliminated controversy or accelerated the enactment of legislation. Passage of the America Invents Act, a set of sweeping reforms of U.S. patent law signed into law in 2011, was a protracted and contentious process. But evidence from research was regularly cited both in the genesis of many of the reform proposals and in their discussion and resolution (Federal Trade Commission, 2003; Merrill, et al., 2004). Likewise, research results have been cited in the legal briefs and decisions in several of the landmark federal appeals court decisions of the last decade. Most important, when new issues arise in patent law and policy, it is usually not long before parties to the debate ask, "What is the research-based evidence?" rather than rely solely on the claims of practitioners and other stakeholders. We consider these positive developments and believe that copyright issues could benefit from a similar investment in research.

## INTERNATIONAL CONTEXT

Although our committee's focus is informing copyright policy development in the United States, the principle that policy should be shaped by research-based evidence applies as much to international as to domestic copyright frameworks, whether in bilateral relationships, multilateral negotiations such as ACTA and TPP, or global norm-setting institutional arrangements such as WIPO or the enforcement activities of the World Trade Organization (WTO).

Fortunately, there has been some productive thinking about an evidence-based approach to intellectual property in the international context to build upon. This is particularly true in the United Kingdom—from the Commission on Intellectual Property Rights and Development in 2002, the Gowers Review (H.M. Treasury, 2006), the work of the National Endowment for Science, Technology, and the Arts (2009, 2011) on the economic context of copyright, to the Hargreaves Report to the U.K. Government in 2011. Investigators should also consult the recent vigorous copyright debates in several advanced and developing countries—from Canada and Brazil to Colombia—in framing research questions as well as in identifying opportunities for internationally comparative studies.

## COPYRIGHT RESEARCH QUESTIONS

Copyright protection seeks to establish enforceable and transferable exclusive rights to exploit creative works in certain ways. These exclusive rights coexist with various exceptions, limitations, and compulsory licenses. As a whole, this system aims to encourage creative expression and the dissemination and preservation of creative works without stifling cumulative creativity, technological innovation, or free expression. In this report, we argue that the assumptions upon which these aspirations are built and the results that the law in fact achieves should be the subjects of robust ongoing research to inform copyright policy discussions. The research we call for is especially critical in light of digital age developments that may, for example, change the **incentive** calculus for various actors in the copyright system, impact the **costs of voluntary copyright transactions**, pose new **enforcement** challenges, and change the optimal **balance** between copyright protection and exceptions.

With respect to changing *incentives* for creators, distributors, and users, research could help determine

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- the costs and benefits of current enforcement methods vis-à-vis proposed new enforcement methods;
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- the costs and benefits of fair use exceptions and Digital Millennium Copyright Act (DMCA) safe harbors.

In assessing the *balance* between copyright protection and the statutory exceptions and limitations to copyright, research could help determine

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- what adverse effects, if any, exceptions and limitations have on copyright holders and their potential to generate economic outputs and welfare effects.

Eventually, research will help inform decisions about key aspects of copyright policy, including:

- the appropriate scope of copyright protection;
- the optimal duration of the copyright term;
- the best arrangements for correcting market imperfections if any that inhibit voluntary licensing;
- appropriate safe harbors and the fair use exceptions to copyright;
- effective or ineffective enforcement remedies for infringing use and the best arrangements for correcting deficiencies in enforcement mechanisms;
- the advisability of reintroducing a formal registration requirement; and
- the advantages and disadvantages of reshaping the copyright regime with different rules for different media or types of work.

These questions are amenable to a variety of research approaches including:

- historical case studies
- international comparisons
- sectoral comparisons
- quantitative data analysis that is either descriptive or causal and
- experiments and surveys

The list of topics and methods is not exhaustive and is illustrative of a fairly directional research program based on assumptions about the current state of technology and geared to incremental improvements in the market and social benefits of copyright. A research program should also

provide some opportunities for more open-ended research into economic relationships among participants in a swiftly changing creative landscape with rapidly declining barriers to entry.

## THE OVERRIDING NEED FOR DATA

A critical precondition of good empirical studies is the availability of data. One important type of economic data is administrative records maintained by government agencies. Although there are important informational gaps because there is no formal reporting requirement for patent licenses and changes in assignment or ownership, research on patents has the benefit of an almost complete set of data on what patents are applied for (at least within 18 months), what patents are issued, and initially to whom. Since formal copyright registration is not required to obtain protection, there is no comprehensive set of administrative data on copyright protection or ownership. Data on registrations with the Copyright Office of the Library of Congress provides useful information on many of the most important copyrighted works, but such records are incomplete and historical records are difficult to access. On the other hand, as with patent litigation, the federal judicial system generates a complete set of data on who sues whom for what copyright violations and, with the important exception of out-of-court settlements, with what outcomes, as well as on criminal prosecutions and resulting penalties. Other important administrative data are collected in mandatory federal government surveys of businesses, employment, expenditures for research and development, and other business activities.

Unquestionably, the most crucial data for analyzing the impact of copyright and of digitization reside in the private sector. Fortunately, the digital revolution, while transforming the conditions underlying the copyright system, also means that a wealth of information relevant to the functioning of the copyright system is generated and stored routinely in the course of business—for example, purchases, licensing transactions, and website views, among others. The challenge is that these data are in the hands of a multitude of private collectors—sellers, Internet service providers, and search engines. Much of that information is proprietary or subject to trade secrecy and privacy protections and thus is not subject to disclosure. Little of it is in a form readily usable by researchers. Even for the data that businesses may be willing to share, there are often very substantial hurdles in collection, aggregation, and transmission.

We devote a good deal of this report to enumerating these data sources, explaining their relevance to public policy concerns, exhorting collectors to make them available on reasonable terms to qualified investigators, and demonstrating the importance of public and private investment in

overcoming these collective action problems. Without the data, empirical researchers will be frustrated in their efforts to illuminate the copyright system. On the other hand, making data available will enable the community of academic and industry investigators to propose, design, and carry out policy-relevant studies well beyond those we discuss in this report.

Drawing on work commissioned by the committee, the next part of this report presents the case for developing a broad empirically-based research agenda on copyright law and policy. It begins with an overview of the logic and evolution of copyright and then surveys the importance of copyright-impacted industries and copyrighted works to the nation's economy and how they have been affected by digital technology. It concludes by briefly reviewing how the existing literature reveals the limits of our knowledge about the efficacy and intended and unintended effects of copyright protection.

# 2

# Copyright Law and Economics in the Digital Era

## COPYRIGHT LAW'S ACCOMMODATION TO DIGITAL TECHNOLOGY

The principal justification for copyright is captured in the U.S. Constitution (Article 1, Sec. 8), which grants Congress the power "to Promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries." This language authorizes Congress to create *private rights* for authors and inventors for the *public purpose* of advancing social progress. As the Supreme Court has explained, "[t]he economic philosophy behind the clause . . . is the conviction that the encouragement of individual effort by personal gain is the best way to advance public welfare through the talents of authors and inventors." (*Mazer v. Stein*, 347 U.S. 201, 219 (1954)). Under copyright law, that encouragement takes the form of "valuable, enforceable rights" that motivate the production of literary or artistic works "of lasting benefit to the world." (*Washington Co. v. Pearson*, 306 U.S. 30, 36 (1939)). Recognizing that progress in creativity depends critically on the freedom to build upon the ideas and expressions of others and that exclusive rights can at times impinge upon freedom of expression, the evolution of copyright law has required tailoring and balancing to ensure access, facilitate subsequent creativity and innovation, and promote knowledge, democracy, and social discourse.

Although motivations to create and disseminate vary from industry to industry—as do the levels and types of investment required for various types of works—at least some individuals and organizations will

likely forgo such investments if they are unlikely to recoup them due to infringing copying and distribution by others who seek to profit without compensating the copyright owners. The economic justification for copyright—and for most other forms of intellectual property—thus lies in ensuring that creators have appropriate incentives to engage in creative activities by granting them a bundle of exclusive rights to use their works. Although copyrighted works can be commercial failures, this proprietary approach affords copyright owners the opportunity to charge a price above the cost of the medium—e.g., film, recording, screen, network, or printed page—on which the copyrighted work is distributed. Exclusive rights for authors can also impinge on subsequent creators and technological innovators, however. The key to ensuring that copyright serves the public welfare lies in balancing the social benefits and costs of providing economic incentives for creation by limiting the duration of copyright, making exceptions, and ensuring that copyrights are mandatorily available for licensing in some circumstances.

For those readers less familiar with the origins and evolution of copyright protection, an appendix to this report summarizes this history and compares copyright and patent law. In the remainder of this section, we focus on legal developments in the digital age.

Advances in the technologies for creating and distributing works of authorship have played a critical role in shaping copyright law throughout its history. Although computer technology became a reality more than half a century ago, it is only in the past two decades that the digital age has begun to disrupt the foundations of the traditional content industries—publishing, music, film, photography, and television. Their long-standing business models—selling books, newspapers, magazines, and recordings, exhibiting films (and later selling and renting home videos and DVDs), and broadcasting music and television shows—had proven quite resilient to the early generations of computer technology. The relatively late onset of the digital piracy threat can be attributed to the sheer informational magnitude of music and film and the ability, only fairly recently, to bring to market affordable, high resolution means for listening to and viewing digital content. Even with the introduction and rapid popularity of digitally-encoded compact disks (CDs) and the proliferation of microcomputers beginning in the early 1980s, content industries did not appreciate the dramatic changes that would be brought about by the emerging digital technologies. Availability of microprocessors, the low fidelity of computer peripherals, and limitations of memory storage capacity prevented content from being stored, perceived, and reproduced efficiently on computer devices until the mid-1990s.

The rollout of the World Wide Web, with its unprecedented ability to distribute digital content instantly and broadly and at no additional or

very little cost, marks the beginning of the digital age for many of the content industries. The emergence of peer-to-peer and related decentralized content storage and distribution technologies disrupted the traditional functioning of many content industry business platforms. These technologies have afforded Internet users a growing number of sources of content outside of the authorized distribution channels. Although copyright's protections provided a theoretical means for enforcing rights to copy and distribute protected works, various features of the Internet—such as the relative anonymity of file sharers—have made copyright enforcement against end users difficult in many contexts.

As a result, copyright owners have sought to prevent infringing distribution higher up the distribution chain. This has brought into play the online service provider safe harbors that Congress introduced into copyright law in the Digital Millennium Copyright Act of 1998. Subject to several exceptions and limitations, the DMCA afforded copyright owners rights against those who circumvent copy protection technologies but insulated online service providers from liability for infringing acts of their subscribers.

The Supreme Court had already begun to address the issue of indirect or secondary liability—that is, the standards by which defendants can be held liable for infringing behavior by other people such as employees, tenants, or customers which were not clearly defined in the 1976 Copyright Act. In *Sony v. Universal City Studios*, 464 U.S. 417 (1984), the Court considered whether Sony should be held liable for manufacturing and marketing video tape recorders for home use. The Supreme Court held that "the sale of copying equipment, like the sale of other articles of commerce, does not constitute contributory infringement if the product is widely used for legitimate, unobjectionable purposes. Indeed, it need merely be capable of substantial noninfringing uses." The Court concluded that Sony's Betamax device was "capable of substantial noninfringing uses," including "time-shifting" of broadcast television programs for private home use, which the Court held to be noninfringing fair use.

The *Sony* decision represented an early attempt to grapple with the balance to be struck between protecting copyrights and technological innovation. The Court explained that the law should "strike a balance between a copyright holder's legitimate demand for effective—not merely symbolic—protection of the statutory monopoly, and the rights of others freely to engage in substantially unrelated areas of commerce."

The Supreme Court revisited this balance again in its 2005 opinion in *MGM v. Grokster*, 545 U.S. 913 (2005), where it considered whether the operators of file-sharing networks could be held indirectly liable for infringing distribution of copyrighted works by users of their services. Notwithstanding the potential noninfringing uses of such services, the

Court rejected the lower court's holding that the *Sony* rule insulated the defendants from liability. The Court held that the defendants' intent to cause and benefit from infringement, demonstrated in part by internal communications, could expose them to liability for inducing infringement even if the defendants' service were capable of non-infringing use. The *Grokster* decision held that "[o]ne who distributes a device with the object of promoting its use to infringe copyright, as shown by clear expression or other affirmative steps taken to foster infringement, is liable for the resulting acts of infringement by third parties."

In reaching this conclusion, the Court stated that "[t]he more artistic protection is favored, the more technological innovation may be discouraged; the administration of copyright law is an exercise in managing the trade-off." The Court concluded that imposing inducement liability maintains a proper balance, while emphasizing that "mere knowledge of infringing potential or of actual infringing uses would not be enough here to subject a distributor to liability. Nor would ordinary acts incident to product distribution, such as offering customers technical support or product updates, support liability in themselves. The inducement rule, instead, premises liability on purposeful, culpable expression and conduct, and thus does nothing to compromise legitimate commerce or discourage innovation having a lawful promise."

In the wake of *Grokster* and continuing rapid advancement in digital technology, the doctrine of indirect liability is among the most critical, subtle, and important features of digital copyright protection. Other key areas affecting the balance among technological advance, freedom of expression, and copyright protection include fair use and the DMCA's online service provider safe harbor provisions, where statutory ambiguity and the challenge of applying even recently adopted law to unanticipated technological advances leave significant leeway for judicial interpretation.

## THE ECONOMIC VALUE OF COPYRIGHT-AFFECTED INDUSTRIES AND COPYRIGHTED WORKS

In recent decades there have been several industry-led efforts to quantify the economic scope of copyright and its exceptions, following methods recommended by WIPO (2003, 2012). Two principal sponsors of these studies are the International Intellectual Property Alliance (IIPA) (Siwek, 2011), representing the recording, motion picture and television, computer software, and publishing industries reliant on copyright, and the Computer and Communications Industry Association (CCIA) (Rogers and Szamosszegi, 2010), representing Internet publishing and broadcasting, Internet service producers and search engines, data services, computer equipment and components, computer services, telecommunications, and

other industry segments that "would not exist, or be much smaller, but for the limitations and exceptions to copyright law." Both trade associations have documented their members' large contributions to gross domestic product, exports, and employment and their high growth and labor compensation rates. The U.S. Commerce Department recently used a similar methodology to estimate the contributions of all types of intellectual property protection to the U.S. economy (U.S. Department of Commerce, 2012).

These analyses provide some insight into the scale of economic activity in the United States affected by copyright, although none addresses the contribution of the copyright legal framework to these industries' economic performance as distinct from many other factors. Nor do they tell us what the creative economy would look like under different copyright rules. The committee considered another approach to measuring the economic impact of copyright protection—the value of the capital stock of copyrighted works themselves in relation to other so-called intangible or intellectual capital assets such as research and development, workforce skills, organizational competence of business enterprises, and other components. A 2006 analysis by the staff members of the Federal Reserve Board, since expanded and extended to other advanced economies, estimated that private and public investments in intangible assets exceed investments in physical capital and are a major driver of economic growth and productivity but have been under-represented in national economic accounting because traditionally they have been treated as immediate expenses of businesses and government rather than investments with payoffs over a long term (Corrado et al., 2006a, 2006b).

For more than a decade the Commerce Department's Bureau of Economic Analysis (BEA) has been addressing the challenge of treating long-lived intellectual capital as investments and incorporating estimates of their value with an appropriate depreciation rate in the National Income and Product Accounts (NIPA). Treating computer software in this fashion was the first major step (Parker and Grimm, 2000). An accounting of research and development has been developed as a so-called "satellite" account and is scheduled to be incorporated in the NIPAs in 2013 (Lee and Schmidt, 2010). And recently, BEA staff members have been developing estimates of long-lived copyrighted "entertainment originals," including books and movies.

The committee asked the BEA to bring together their estimates of the revenue and capital value of copyrighted works and compare them with other categories of intellectual capital, and the BEA agreed, incorporating estimates of prepackaged, custom, and own-account software, video games (included in software estimates), movies, television programs, music, books, commercial photography, and playscripts.

Some of the key findings are presented below, but a few caveats should be noted. Excluded from their analysis are short-lived (less than one year) copyrighted works such as newspaper and magazine articles, some television and radio programs, and amateur artwork and software, which may have considerable cultural and personal importance but not high market value and therefore are not easy candidates for inclusion in the national economic accounts. Included is federal government generated software not covered by copyright. BEA also includes many works that are subject to other forms of protection (e.g., patent and trade secret) in addition to copyright. For these and other reasons, it would be unwise to conclude that all of the value of the works counted by the BEA can be attributed to copyright protection. It is nevertheless the case that changes in the value of copyrighted works might reflect changes in the effectiveness of copyright law more directly than would total industry revenues, employment, or other factors captured in the IIPA and CCIA studies described above.

Among the BEA findings:

- In 2007 U.S. businesses and governments invested $278 billion in software (approximately $83 billion prepackaged, $93 billion custom, and $102 billion own-account) and U.S. artists produced $71 billion worth of long-lived entertainment originals. These assets yield returns over varying periods of time, roughly 15 to 50 years for artworks and 3 to 5 years for shorter-lived software. The accumulated capital stocks of these assets in 2007 are estimated to have been $486 billion for software and $536 billion for entertainment originals.
- The same year, software accounted for 2 percent of nominal GDP (rising from zero in 1959), treating it as an asset rather than an expense raises GDP. Entertainment investment has accounted for roughly the same share of GDP, 0.4 percent, since the 1920s and therefore does not affect GDP growth when treated as a capital asset.
- In addition to the long-lived entertainment originals, approximately $96 billion of short-lived artistic products—television, radio and Internet programming, and magazines and newspapers were produced in 2007. With a lifespan of less than one year, these are not candidates for capitalization in the NIPAs.
- The shares of different categories of artwork have changed dramatically over time with technological change such as the advent of television and the Internet and the decline of newspapers and magazines.

- The software and artistic original values compare with the Corrado et al., 2000 estimates for other intangible capital: $200 billion for all U.S. scientific research and development, $140 billion for advertising contributing to brand equity, and $365 billion for spending on firm-specific worker training and business organizational change.

Without question, copyright-affected industries contribute significantly to GDP employment, especially higher payment employment, and trade. Some copyrighted works, especially software, contribute as well to innovation and higher economic and productivity growth. These data do not tell us anything specific about the role that copyright plays in generating these assets nor about the impact of any particular copyright policy choices, but they encourage us to pursue better answers to those questions. In the absence of copyright, not all of the value of creative works would disappear. Firms would be and are coming up with other means of protecting their investment in creative activities.

## THE IMPACT OF DIGITAL TECHNOLOGIES ON CONTENT CREATION, DISTRIBUTION, AND USE IN SELECTED INDUSTRIES[1]

The relatively recent onset of the digital piracy threat can be attributed to the sheer informational magnitude of music and film and the inability, until about two decades ago, to bring to market affordable, high resolution means for listening to and viewing digital content. Even with the introduction and rapid popularity of digitally-encoded compact disks (CDs) and the proliferation of microcomputers beginning in the early 1980s, the record industry did not appreciate the dramatic changes that would be brought about by the emerging digital technologies. Available microprocessors, the low fidelity of computer peripherals, and limitations of memory storage capacity prevented music from being stored, perceived, and reproduced efficiently on computer devices until the mid-1990s. The proliferation of file-sharing technologies and unauthorized streaming services such as cyberlockers, in conjunction with advances in data compression and broadband penetration during the past 15 years, have dramatically shifted the market for many copyrighted works.

[1]The sections below on music, films, and book publishing draw upon a commissioned paper by Lisa Cameron and Cameron Bazelon, "The Impact of Digitization on Business Models in Copyright-Driven Industries: A Review of the Economic Issues," 2013. The section on scientific publishing draws on a commissioned paper by Michael McCabe, "Online Access and the Scientific Journal Market: An Economist's Perspective," 2013.

Technological advances associated with the Internet and digitization have had profound effects on both the rewards available to creators and the costs they face in bringing works to market. The ease of infringing digital copying and distribution often weakens sales and reduces the revenue available to creators for a given level of legal copyright protection. On the other hand, marginal manufacturing and distribution costs have fallen drastically and in some circumstances shifted to intermediaries as digital products come to replace physical goods. The Internet enables near instantaneous and free distribution to mass audiences in conjunction with robust advertising networks. The costs of creating and promoting new works may also have fallen in some cases and risen in others.

The results have been complex. Authors can more easily create and distribute works of authorship using digital technology and networks, yet they and their distributors have substantially lost the ability to prevent or pursue infringing distribution of copyrighted works. The magnitude of these effects on different creative sectors are difficult to quantify, but disruptive changes in traditional supply chains and the destruction of some older business models and enablement of new ones are easy to identify. And they have had profound consequences not only for intermediaries and consumers but also in some cases for content creators. That is not to say that all industries based on copyrighted materials have experienced disruptive change. Architectural designs and certain specialized engineering products have likely been much less affected by the Internet. Nor on the other hand is the digital revolution confined to the copyright protected industries. Online retailing has had profound effects on brick and mortar retail stores that specialize in non-content based goods.

The committee commissioned efforts (Appendix B) to summarize qualitatively the changes in five large content industries—music recording, film production and distribution, book publishing, scientific publishing, and software—and supplemented the analysis with committee members' own direct experiences in those industries. The following descriptions, which draw on these papers, are meant to be illustrative, not exhaustive. Other fields such as still photography have faced unusual challenges in the digital era that are very much worth exploring in research.

### Music

Digital technologies and Internet distribution have profoundly affected the creation, marketing, and distribution of sound recordings in the global music business. These technologies enabled distribution of sound recordings as digital files separate from the physical media on which they were fixed, which enabled the unbundling of the song from the industry's dominant consumer product, the album-length CD. Con-

sumer preference for downloading of individual songs further diminished the importance of the industry's previously most lucrative product. Supply of sound recordings has also greatly expanded in the digital age. Low cost audio and video production tools have lowered musicians' costs to create musical works, adding to supply, and online retailers' low marginal cost of digital storage has allowed these retailers to offer for sale millions of sound recordings, whereas floor space constraints of brick and mortar retailers limited inventory carried to fewer than 10,000-15,000 albums.

Digital technologies have also changed the ways that consumers discover music and this, in turn, has altered the industry's marketing and promotion strategies. Traditional mass market promotion channels, such as radio, that focused on a fewer number of songs, have been augmented by targeted, user-user driven social marketing that is available to all recording artists whether or not they are signed to a record label. Social networks are used to create digital word-of-mouth among communities of fans and these services (Facebook, Twitter, YouTube, and others) can be used with equal effectiveness by record company-financed celebrity musicians and self-financed amateur bands. Digital streaming technologies in conjunction with a statutory license created by the Digital Millennium Copyright Act, has allowed customers to receive highly customized Internet radio channels. Finally, the continuing wide availability of infringing music on the Internet has forced legitimate Internet music services to expand other services—playback on mobile devices, library management, and navigation—to make it more attractive for consumers to listen to legally obtained sound recordings than illegal substitutes.

New business models in music include:

- Digital music stores, such as iTunes and Amazon, selling online the works of musicians and record companies, but competing with file-sharing and other unauthorized versions of the same music;
- Ad-supported Internet radio services, such as Pandora, enabled by statutory compulsory licenses of the underlying copyrighted content;
- Paid music subscription services, such as Spotify, that do not convey the full rights of music ownership and provide greater revenue to copyright owners than ad-supported streaming services;
- Music video plays on YouTube providing the copyright owner a portion of advertising collected on each video view;
- Social networks enabling major label recording artists and unsigned bands to organize fans to purchase downloads, watch videos, and attend concerts;

- Do-it-yourself distribution and marketing platforms, such as ReverbNation, providing emerging and established bands new tools to market, promote, and monetize their copyrights at a grass roots level;
- Crowd-sourcing funding platforms, such as Kickstarter, enabling musicians to solicit voluntary contributions to fund studio recordings, video production, and tours;
- Software authoring tools, such as ePub3, enabling musicians to create digital boxed sets that include text, video, photos, Internet links, potentially bundled with sale of concert tickets.

To preserve as much as possible of the traditional industry model and revenues associated with copyright, major record companies have looked to legal enforcement and various rights management software that prevents consumers from accessing music outside of their rights. For example, paid subscription services limit copying music and prevent access after the subscription period ends. Profits from record companies' incumbent business models have been a disincentive to embrace disruptive innovation. However, the industry did adapt to the pressures of the digital revolution with both 99 cent downloads and ultimately unprotected downloads.

It is unclear whether traditional recorded music companies will continue to dominate the industry as they have in the past, having lost much of their distribution function to increasingly powerful online retailers, file-sharing, and do-it-yourself marketing platforms. Functions such as discovering new talent, promoting and marketing musicians, all mainly the preserve of the record companies in the past, remain critical, but are now contested by a variety of new players that give artists a greater share of revenues.

It is not certain how music composers, performers, and consumers fare under the new business models compared to how they fared under the previous system. Broadcast performances account for a smaller share of composers' earnings, and they are relatively unaffected by changes in distribution; but the lion's share of their earnings are associated with mechanical licenses, which are affected by changes in distribution. Likewise, some performers make significant income from concerts, which are not affected by digital business models. Moreover, artists are not homogeneous. The smaller number of superstars fare very differently in supply chains than do unknown or emerging musicians.

We also do not know how the baseline for determining the optimal supply of new music has been changed by the digital age. It could be the case that artists' incomes and consumer welfare could rise under a better

functioning music copyright system, particularly one more accommodating of innovation enabled by technological change. On the other hand, it would be that better enforcement could result in lower consumer surplus and artist income, with more profit reaped by intermediaries.

### Film

The motion picture supply chain is comprised of multiple stages—development, financing and production, distribution and marketing, exhibition in theaters, and post-theatrical release—home entertainment sales and rentals, television, and cable. Although digitization has affected all stages of the motion picture supply chain, from a revenue perspective, its greatest impact has been on post-theatrical release. Online distribution is becoming more important as broadband and 4G wireless increases and more consumer electronic devices such as televisions and Blu-ray players are integrated with Internet connectivity. Sales of tablets and smartphones also contribute to the growth of online services. Consumers now have the choice to download or stream from dozens of online services using subscription, rental, sell-through or advertiser-based business models. Content now available through third party applications is available across many platforms including Android, iOS, and Windows. Prominent examples include

- Subscription online video services previously dominated by Netflix are now being offered by a variety of online service providers such as Amazon Prime, Microsoft Xbox, HBO Go, Xfinity, and Hulu Plus. In November 2002 Hollywood studios launched the first online video rental service. Since then, as broadband penetration increased, additional online services have launched—iTunes, Amazon, PlayStation, Xbox, Walmart/VUDU, Blockbuster, Comcast, DirectTV, AT&T, Verizon, and many others.
- Digital sell-through has also flourished. Consumers can now collect content in their own personal cloud service, called Ultraviolet, and watch their movies and TV shows anytime and anywhere on any Internet-enabled device. Consumers no longer need to be locked into to a proprietary service and/or device.
- The advertising-based model uses the same technology as the online video store but relies on advertising revenues rather than subscriptions or pay-per-view. This has attracted a large number of entrants, Hulu and Crackle being the most successful, although it is moving toward a subscription business model.

- Cable and satellite and telephone companies provide additional film distribution outlets.
- Major studios have also launched new online services offering movies and television shows directly to consumers, competing with traditional intermediaries.

Digital distribution through Blu-ray, DVD, and cloud services such as Ultraviolet, and authorized online services described above provide a promising opportunity for motion picture distributors to offer consumers the ability to access movies on the platform of their choice but also for independent and niche filmmakers lacking access to theatrical distribution to reach a broader audience. However, the persistence of Bittorrent file-sharing platforms and ad-supported cyberlockers continue to have a significant destabilizing effect on this market. Although copyright law and other remedies under the DMCA remain an effective tool against infringing services located in the United States, most, if not all illegal services have moved off shore to territories that lack effective enforcement mechanisms making it nearly impossible to slow the proliferation of infringing download and streaming services. While the motion picture industry has embraced more distribution channels than ever before, the greatest threat facing the industry is the illegal distribution of movies while still in theaters. This has had the greatest impact on independent filmmakers that have struggled to achieve financial success and reliable financing.

### Book Publishing

In the traditional supply chain model, authors seek out publishing houses that pay them an advance and royalties, sometimes find and groom authors, and finance the editing, reviewing, printing, marketing, and distribution of the book. Despite slim profit margins, this model persisted more or less unchanged since the introduction of large-scale production of low cost printing technologies, until the appearance of e-books, which began to increase market share in 2007 and are likely to surpass physical book sales within a few years.

Following the example of Apple, which marketed its iPod as the device on which consumers could enjoy music purchased from the iTunes store, book retailers adapted to digital technology by marketing e-readers, Amazon's Kindle and Barnes and Noble's Nook, as well as e-books with lower prices but higher profit margins than physical books. Apple followed in 2010 with the iBooks app on the iPad, followed now by Google on Android devices. E-books eliminated a publisher's physical production and distribution costs. Moreover, digital distribution enables authors

to create and distribute their works cheaply or freely through online bookstores without the intermediary publisher. "Self-publishing" has been highly successful for some authors but is unlikely to be the most advantageous path for all. Major publishers continue to provide marketing and promotion that an individual author cannot do alone or as efficiently. But e-books and other digital materials have led to conflicts between book publishers and libraries, with charges of price-gouging, limiting the number of readers of an e-book copy before a new license must be purchased, and withholding titles.

### Scientific Publication

The impact of copyright extends well beyond what are traditionally regarded as the creative domain—music, film, art, literature, and photography. We illustrate this impact here with two examples: software (discussed in the next section), and the publication of scientific research results. This is far from an exhaustive treatment of copyright's reach outside of the traditional creative realms. Indeed, with the advent of research tools such as text and data mining, copyright can reach into the conduct of scientific and medical research itself.

Scientists increasingly use automated tools to mine and recombine vast amounts of data and literature. The capacity to link collections of articles and data to integrate research results across several scientific disciplines and to develop data-mining tools for application across various fields offers immense new opportunities for science in the digital era, including opportunities to build field-specific repositories to advance new research directions. In short, the digitization of scientific information offers unprecedented opportunity to significantly enhance the speed of dissemination of research results, facilitate development of highly effective research engines that diminish search time for publications, and for automated cross-linking, text mining, and data aggregation. The role of copyright law in this growing digital infrastructure is contested, and it is unclear whether the existing framework is sufficiently aligned to enable maximization of these opportunities to enhance and facilitate new directions for scientific research.

The role of copyright in the dissemination of scientific information is also debated in the wake of digital publishing and associated disruptions of the classic publishing model that has dominated the sciences since the 17th century when scientific journals emerged to perform the important functions of establishing scientific priority, certifying quality through peer review, communicating results, and providing archival records. It is rare that publishers compensate scientific publication authors, who are motivated, in part, by their employers' criteria for selection, promotion, and

tenure decisions. In some sectors, publishers charge both author fees and reader fees, although the latter are generally paid by institutions through subscriptions. A variety of factors affect pricing on both the author and the reader side of the publishing "platform." Many journals are published by firms that own or manage multiple titles; a few large firms control portfolios numbering in the hundreds or thousands. The modern print era has been characterized by rapidly rising subscription prices in excess of inflation and straining library budgets.

The shift to electronic distribution of content that began in 1995 lowered distribution costs and enabled the emergence of commercial and non-profit open access (OA) journals that can be accessed at no charge and that recover their costs through a combination of author fees, grant monies, and government subsidies. The Social Science Research Network (SSRN) was founded in 1994 and distributes over two million academic papers. The Public Library of Science (PLoS), founded in 2001, is the best known online scientific publishing platform based entirely upon the open access business model. The Directory of Open Access Journals (DOAJ) currently lists more than 6,000 titles. Many research universities and funding organizations—notably, the National Institutes of Health under a congressional mandate—have adopted open access mandates; and Google Scholar, introduced in 2004, quickly became a powerful complement to online access. The OA journal movement has grown rapidly in the past decade.

Earlier, commercial publishers adopted a strategy of bundling multiple titles in large deals negotiated with each institution. This strategy took advantage of the fact that although online distribution lowered distribution costs, it did not change the basic inelastic demand conditions of the market. Annual price increases from the major, for-profit publishers of scientific, technical, and medical journals have been running at multiples of the U.S. consumer price index for several years. Although open access journals continue to proliferate, their long-term viability in the absence of subsidized author fees is uncertain unless additional contractually imposed access conditions become integrated into funders' research grants.

Open access has the potential to expand the dissemination and impact of the scientific literature, benefiting scientists and society. Early studies of this question showed large positive benefits, generally in terms of increased citations and downloads. More recent studies taking into account the differences between open access and traditional journals find little or no impact of open access on citations. Citation rates do not necessarily fully reflect the impact of open access, however, which might include wider readership, use of results in therapeutic settings, and other developments. These are important questions for further study.

Desktop publishing techniques and online digital transmission have reduced costs and enabled new publication and licensing models allowing for more differentiated approaches to formal and informal peer production of scientific information. In this environment there is a need for data-driven research to inform policy choices that will take advantage of these new opportunities for scientific research, aggregation, and dissemination, avoid fostering monopolies over non-substitutable, non-replicable scientific information, and preserve the most useful functions that intermediaries provide.

### Software

An arcane field 50 years ago, software has become an integral part of almost every process, product, and service we use both directly and indirectly. Often it is the principal differentiator of one product or service from another. Software represents a growing share of the intangible assets that account for the wide gap between the book value and the market value of many public corporations.

Although patent protection for computer software has gained salience during the past decade, copyright has long been the principal form of protection for computer software products. Even open source software relies upon copyright as the means to enforce compliance with the terms of the open source license. As is true with other types of copyrighted content, software comes in a variety of forms sold under a variety of business models. Consumer software is actually licensed and not sold, but to the consumer the transaction is much like that for a book, movie, or song, so parallels are easily drawn. This was a $21 billion industry in 2010 including personal computer games. Just as with music, books, and video, more and more software of this sort is licensed and delivered via electronic download, and the optical media historically used for this is fading away.

Gaming, a particular class of consumer software, is a huge industry in its own right. Starting with simple video arcade games, gaming has evolved to cover a wide spectrum from simple games to pass the time or facilitate social interaction to first-person action games such as *Call of Duty* or massively multiplayer online games such as *World of Warcraft*. Nintendo, Sony, Microsoft, and others have created multibillion dollar businesses around specialized game-playing computer consoles, but games can and are played on any computer including smartphones and tablets. Whether online or on a device, copyright is the basic legal protection for games. Vendors have resorted to numerous proprietary mechanisms to further secure their games to prevent infringing use with varying degrees of success. One great advantage of gaming consoles is

that a game designed for a particular console can only be played on that console, and the vendor is able to fully control that device to inhibit any illegal use. Online games are operated as a service with different issues around uncompensated use.

Another rapidly growing consumer software market consists of apps (applications) for mobile devices. Vendors, except for devices running Android software, have made unauthorized copying of apps difficult by requiring that all packaged software be acquired through a single authorized store. This trend is now moving to personal computers. Consumers lose choice but gain convenience and, arguably, security.

Enterprise packaged software is also vulnerable to infringing copying but is more dependent on specialized skills, installation and maintenance. The total market was estimated at $267 billion in 2011. Platform packaged software is more difficult to measure because its value is intertwined with the hardware with which it is coupled. Microsoft Windows has long experienced massive copying in some international markets, but in most developed markets the software is either bundled with the hardware or licensed on an enterprise basis. Unlicensed use remains significant, and most major business software vendors rely upon periodic audits of their customers to enforce their licensing terms. Notwithstanding these audits, unlicensed use of business software is by far the most economically damaging infringement problem facing the business software sector today.

The emergence of the "cloud," however, has made all of these traditional methods much more complex to operate. Instead of having a small number of computers each running a designated set of applications with licensing tied to something with a physical serial number, a "computer" today is an "instance" running somewhere in a massive complex and never really existing in a physical form. Moreover, because contemporary systems often use hundreds or thousands of computers running for very short periods of time, the challenges of licensing enforcement are large.

Valuing custom software is difficult. Use of the cost of the labor to produce it as a metric, is incomplete, inasmuch as the costs of testing and implementing software usually greatly exceed the costs of development. While copyright, trade secret, and contractual protections are used to protect custom software, the value of this work may lie in the algorithms the software implements and not in the code itself. These algorithms can potentially be protected by patent or trade secret law but valuing them is extremely difficult. Developing methods of accurately valuing in-house and customized software across different types of organizations, and evaluating the role of copyright, relative to patenting, in shaping investment in and the productivity of such software is an important area for future research.

## THE LIMITS OF OUR KNOWLEDGE ABOUT THE ECONOMICS OF COPYRIGHT[2]

The final and most important project commissioned by the committee is an evaluation of the existing empirical research literature on the economics of copyright. The evaluation draws upon an earlier survey by the same author sponsored by the United Kingdom's Strategic Advisory Board for Intellectual Property Policy (Handke, 2010). The work was intended to be comprehensive up to the time of its completion, taking into account studies conducted and published in the English language. Here we summarize only the key findings.

### The Effects of Infringing Copying

The effects of Internet-enabled infringing use have received considerable attention from empirically-oriented economists, most of them addressing the phenomenon in specific content industries, mainly computer software and recorded music and more recently film. Studies of the extent of infringing digital copying of software focus on the ratios of legitimate users to users of pirated software but do not quantify the likely effects on rights holders' revenues. Although the software industry thrives in spite of infringing digital copying, the advent of digital copying coincides with a sharp drop in revenues in the primary market for sound recordings over the last decade. As a result, infringing copying of music, especially via file-sharing of MP3 files, has received much attention.

As simple as the question seems—the extent to which unpaid consumption of recorded music cannibalizes paid consumption—the answer is rather difficult to establish empirically, for two reasons. First, data, especially data on unpaid consumption, are difficult to obtain. Second, even with good data on consumption patterns, it is difficult to draw causal inferences. For example, an observation that a song with a high volume of unpaid consumption is also purchased frequently could mean that unpaid consumption stimulates sales or, more likely, that the song is simply popular and that its popularity manifests itself in high volumes of both paid and unpaid consumption.

Against the backdrop of this research challenge, empirical studies provide a range of estimates of the impact of unpaid on paid consumption. But the majority of empirical studies of the effect of unpaid music consumption on paid music consumption show a depressing impact and it is likely that infringing copying contributed significantly to the down-

[2]This section draws upon a commissioned literature review by Christian Handke, "Economic Effects of Copyright: The Empirical Evidence So Far," 2011.

turn in recorded music sales since Napster. Studies of paid versus unpaid consumption of movies are not as numerous but also tend to find results consistent with a depressing effect of unpaid consumption. It remains to be seen if studies of other industries—books, newspapers, video games, and photographs—also reveal this pattern. On the other hand, some of this work takes an overly simplistic view of substitution effects, assuming that consumption of unlicensed works displaces *only* the consumption of licensed works and not other activities. Hence, there is a need for further research to determine the nature and magnitude of sales displacement caused by infringing distribution across the range of copyrighted works.

In any case, it is hard for academic studies to keep up with swift technological change. In the past two years, the emergence of cyberlockers has rapidly changed access to copyrighted works. Thus, the growing number of studies of peer-to-peer technology do not adequately address the economic realities currently facing content industries. Furthermore, the rapid rollout of tablet computing will undoubtedly affect the publishing market.

A variety of factors, data limitations foremost among them, complicate the analysis of revenue impacts on intermediaries and creators in the digital environment and how that changes with technology. But even if there were a more conclusive answer, it would be only one consideration in framing copyright policy. User welfare effects, especially benefits and costs to end-consumers, also deserve attention as does the distribution of rewards to artists and other creators.

### Determinants of Infringing Copying

To determine the desirable scope and intensity of copyright protection it would be useful to know what factors influence the extent of infringing copying. Again, with only a few exceptions, the studies have focused on single industry—software, music, or films. In software, the practice has been found to vary inversely with level of economic development and income, the strength of the legal and judicial system, and retail prices of authorized products, although not consistently with education. Several empirical studies find that the perceived probability and severity of penalties have a strong effect on file-sharing. Moral considerations also play a role in the sense that concern for rights holders and artists reduces the propensity to engage in file-sharing, and this varies by country. Most studies conclude that students, young adults, and young males in particular are more likely to engage in infringing copying than other demographic groups.

### Effects of Copyright Law

Empirical research has mainly focused on infringing copying and distribution, but effects of key aspects of copyright law are also of interest, including what aspects of creative works are protected, the type and intensity of enforcement measures, the duration of rights, the scope of copyright exceptions and limitations, the liability standards imposed on intermediaries and third-parties, the availability of easily accessible and affordable legal copies, and the role of digital rights management techniques.

Despite the fact that promotion of innovation and the creation and distribution of new works are the principal rationale for intellectual property protection, very few empirical studies address the effects of changes in the copyright system on their supply of creative works. The handful of studies of copyright term extensions have found no significant effect, although the complexities of isolating such effects are formidable. In any case, such studies are of relatively little significance to the policy debate over online enforcement because such behavior most prominently affects newly released works.

### Costs of the Copyright System

The costs of administering the copyright system also need to be considered in designing appropriate copyright policy, but neither these nor the costs of transacting or enforcing rights have been studied directly. This would be useful in evaluating alternative voluntary collective rights administration schemes and proposed changes to enforcement systems. In view of the likelihood that the effects of infringing copying and distribution are not evenly distributed across the population of artists, we need to understand better the impact of copyright arrangements on the markets for artistic works as well as on innovation in distribution and other activities downstream from creation.

### Conclusions

Overall, the picture that emerges from research is still ambiguous, patchy, and in some respects contradictory. There is inconclusive evidence of how infringing copying and distribution affects social welfare or what kind of copyright regime would redress the problem without excessive unintended consequences. In addition to the characteristics of the literature noted above, the following gaps and limitations, many of them the result of or exacerbated by data limitations, are particularly pronounced:

- In studies of some copyright sectors, the principal focus is on intermediaries' revenues rather than the impact on creators, professional and amateur, and consumers of content.
- There has been uneven industry coverage, with a great deal of attention to music, moderate attention to scientific publishing and film, much less attention to news and book publishing and software.
- Variations across industries, countries, and time are poorly understood.
- There has been very little emphasis placed on the ease or difficulty of transactions to obtain use rights.
- Little consideration has been given to the relative costs and effectiveness of legal remedies (injunctions, civil damages, notice and take down, and criminal penalties) vis-à-vis technical protections (digital rights management and filtering).
- There has been little analysis of the incidence and cost of litigation and what impact litigation costs have on willingness to bring or settle complaints.
- Despite continuing rapid technological change, rendering even some recent findings obsolete, very little work has been motivated by hypotheses about future developments.
- Studies lack a historical perspective on how the copyright system has adapted to technological change in the past.
- Alternative enforcement mechanisms, such as, graduated response and filtering, have received little attention.
- There have been few transnational studies of enforcement mechanisms and their impact on local production.
- There is little understanding of how copyright protection technologies affect the deployment of new general purpose technologies (e.g., cloud computing).

# 3

# Research Directions

In this chapter we propose four sets of research questions that reflect the issues raised repeatedly in the committee's meetings and workshop and relate directly to policy debates playing out in domestic political, legal, academic, and social as well as international venues. These questions have a bearing on pattern and scope of creative expression as well as the structure and profitability of copyright-affected industries. The questions are not exhaustive, but the committee believes that they should form the core agenda of a well-funded, long-term empirical research enterprise.

1. **Impact of digitization on incentives to make, develop, promote, distribute, consume, and maintain the integrity of creative works**

By assigning creators limited rights, copyright aims to incentivize the creation development and dissemination of creative work and to preserve its integrity. How have these incentives been affected by digitization? Similarly, how have copyright and digital technology affected the incentives of other participants in the copyright environment, including consumers?

2. **Enablers of and impediments to voluntary transactions**

Although granting rights initially to creators, copyright law allows creators to assign or license those rights to others—potentially enhancing the value and public benefit of the copyrighted works by permitting broader use, dissemination, and subsequent creative activity. What are the costs associated with such copyright transactions, and what mechanisms help to overcome these costs? How have transactional impediments and enablers changed with digital technology?

**3. Enforcement costs and benefits**
Copyright enforcement mechanisms include civil penalties, criminal sanctions, technical requirements, and intermediary obligations. What are the costs and benefits of these and alternative mechanisms? How well do they address new challenges in the digital age, including those posed by unauthorized access to copyrighted works emanating from non-U.S. jurisdictions that lack effective enforcement mechanisms?

**4. Exceptions, limitations, and balanced copyright design**
Copyright law attempts to balance competing interests of creators and downstream users of copyrighted works through a variety of mechanisms—term limits after which works enter the public domain, enumerated exceptions to address specific policy objectives, general exceptions such as fair use, and compulsory licensing provisions. What is the role and effectiveness of these measures in different copyright domains and what impact do they have on creativity?

The following sections expand on these research topics along with some suggestions of research approaches appropriate for exploring them.

## CHANGING INCENTIVES

As explained above, the leading justification for copyright in the United States has always been to motivate and disseminate creative expression for the public benefit by providing creators and/or their agents with a degree of market power they would not otherwise enjoy. Although this market power can translate into supra-competitive prices for consumers of copyrighted works and into constraints on those who use them as the basis for subsequent creativity, copyright strives to limit these costs to those necessary to generate and disseminate the works upon which subsequent creativity depends. This conventional theory of copyright has been explored in generations of copyright scholarship. But empirical research documenting the actual impact of copyright on incentives of creators, distributors, and consumers is quite limited and thus a key direction for future investigation.

### Creator Incentives

The digital age appears to have profoundly affected creator incentives in at least two ways. First, advances in technologies for producing and disseminating expressive works have reduced the barriers to entry and the costs of creation and distribution for some categories of works. On the other hand, the ease with which works can be distributed over the Inter-

net without authorization or compensation threatens to diminish investment in some creative activities, especially those involving substantial production costs. It is important to know how these changes have affected the spectrum of creators and enterprises engaged in the generation and distribution of creative works.

For example, it would be valuable to know more about the expenses involved in different aspects of creative productivity, including both initial authorship and subsequent dissemination to the public, across different sectors, and the different business models by which those expenses might be recouped. Studies along these lines might document that some types of creative production remain quite expensive in the digital age. It seems likely, however, that digital tools make other types of creativity and dissemination much less costly. These costs should in turn be understood in relation to better understandings of the copyright- and non-copyright-dependent sources of motivation for creative production. Some types of creative production may require investments that are difficult to recoup other than by exploiting copyright protection. Other creators may be motivated by alternative sources of monetary and/or non-monetary compensation—ranging from sales of ancillary products and services, such as live concert performances, to reputational benefits to the simple pleasure that so many Internet uses seem to derive from creating and sharing their own creative expression online without any apparent expectation of exploiting their exclusive rights for monetary gain.

We do not mean by these suggestions to prejudge the results of studies of the costs and motivations of creative expression and dissemination but merely to indicate how such studies would enrich our understanding of the factual basis for the assumptions built into the theoretical justification for copyright and of how those facts may be changing as digital technology affects both the costs of creative production and the power of non-copyright-dependent motivations. Information about creator motivations and costs would not only illuminate theoretical justifications for copyright. It might reveal differences in incentives and costs among types of works such as works for entertainment and scholarly and educational works. Such data would be critical to informed judgments about the merits of differentiated copyright protection—whether, for example, the duration of copyright protection should vary from one type of creative work product to another.

### User Incentives

Another set of motivations is highly relevant to copyright policy: the motivations of various types of users and potential users of creative works. Users include people who currently pay to purchase copies or

otherwise acquire authorized access to copyrighted works for purposes of consuming and/or creatively building upon those works; people who undertake these activities in lawful accord with a copyright limitation or exceptions; people who undertake these activities in violation of copyright law; people who forgo these activities because of the risks and burdens that copyright law imposes; and people who use copyrighted works in ways that fall within areas of legal uncertainty. By "users" we do not only mean end-users but also commercial firms that make use of copyrighted works in the process of supplying other goods and services. With the data called for below regarding patterns of consumption of creative works, studies could be designed to better understand who falls in these various categories and why, and whether and how copyright influences their behavior. For example, it would be valuable to know more about how user motivations and behavior are affected by enforcement efforts—including the extent to which effective enforcement encourages users of infringing copies to turn to legal alternatives.

## ENABLERS OF AND IMPEDIMENTS TO VOLUNTARY TRANSACTIONS

The exclusive rights that copyright law bestows on creators may be voluntarily transferred from creators to others through licenses on either exclusive or non-exclusive terms. This transferability is consistent with copyright's purpose of promoting creativity for the public benefit. It allows creators to derive revenue from their investments in creativity while permitting others to use, disseminate, and build upon their works. Digital technology promises to expand authorized access and iterative creativity, but not if rights are not easily transferred because of transaction costs and other barriers to voluntary exchange. Where such impediments are significant, they may justify policy interventions aimed at facilitating transactions or adjusting aspects of copyright law. Successful examples of voluntary transactions, by contrast, might provide lessons about what works well in the current legal environment.

Questions about the extent and persistence of copyright-related transaction costs and related market failures have been raised and explored in both academic and policy analysis relying on case studies, interviews, and other types of qualitative evidence illustrating both copyright exchange failures and successes. To date, however, there have been few efforts at broad and systematic data collection to support policymaking.

Consider the transaction cost hurdles to voluntary exchange associated with "orphan works," works for which the copyright holder cannot be readily identified or located for the purpose of entering into a voluntary exchange agreement. Even if the author and publisher are found,

rights to the content may be unclear. To assess the magnitude and policy implications of the orphan works problem, it would be useful to have data on the share of copyrighted works for which the owner cannot be located and how this share is changing over time. But such works are not comprehensively listed or collected anywhere. This data gap may be especially severe with regard to documentaries and other remixed or "user-generated" content.

Despite this difficulty, a number of promising research avenues seems worth pursuing. One approach is to focus on an identifiable subset of copyrighted works and attempt to measure the percentage of difficult-to-license works within that corpus. If, for example, one could estimate the share of difficult-to-license photos in the collections of cultural heritage institutions, that could inform an understanding of both the scope of the problem and the challenge of digitizing such collections for preservation and public education.

Another approach to studying enablers of copyright transactions is to survey participants in the copyright market about their experiences. Questions can probe the costs as well as the frequency of problems and can document and attempt to identify factors that have made some efforts to assemble large authorized collections of licensed works relatively successful for some categories of copyright work. For example, retailers such as Amazon and Apple, among many others, offer digital storefronts featuring massive collections of digital works which they do not own, but have licensed.

Especially valuable would be comparisons of U.S. experience with other countries, before and after policy changes aimed at solving orphan works problems or other challenges associated with works for which licensing is possible but practically difficult. These include various forms of compulsory and/or collective licensing.

Voluntary collective licensing organizations and other intermediaries that seek to help individuals overcome barriers to exchange are worthy of further study in their own right. Relevant intermediaries that are active in the United States include American Society of Composers, Authors, and Publishers (ASCAP) and other performance rights organizations. Other examples are promulgators of public licenses (e.g., Creative Commons and the Free Software Foundation), universities that have adopted uniform practices for the licensing of faculty work, and funding entities that specify the terms on which the copyrighted scholarship they sponsor will be released and used. Some of these institutions and practices have foreign counterparts that may be illuminating.

A different approach to these questions would use the insights of experimental psychology, which have contributed to the study of transaction cost economics and could be applied more extensively in the study

of copyright markets. This work is based not on observational data about actual market practices but on carefully designed experiments to illuminate sources of bargaining breakdowns and strategies to overcome them or, on the other hand, circumstances in which creators are motivated to license their works in the interest of wider distribution or follow-on use.

These research approaches could advance understanding of a number of important policy-related questions: Are licensing markets more successful in some sectors than others and why? What if any special problems are encountered in books, photographs, scientific research, user-generated content, mash-ups, and other derivative works? Where does inadequate notice of copyright status and rights-holder identity and preferences impede voluntary licensing? How has this changed with changes in government registration and the advent of private registries? How have transaction costs changed with new technological, business, and legal developments? How is technology being used and in what ways might it be improved to facilitate the tracing of copyright ownership and licensing terms? What roles can public and private institutions play in voluntary transactions?

## ENFORCEMENT COSTS AND BENEFITS

Many recent policy debates have focused on copyright enforcement, with advocates of enhanced penalties, new enforcement mechanisms, and enhanced international enforcement coordination citing the cost and ineffectiveness of enforcement mechanisms available under current law and, in particular, the difficulty of preventing the infringing distribution of copyrighted works from websites located in jurisdictions that lack effective enforcement mechanisms. Opponents in these debates raise concerns about the potential for zealous enforcement to discourage legitimate activities and chill technological innovation. These disagreements highlight gaps in our knowledge about the effectiveness, costs, and unintended consequences of different tools for copyright enforcement.

The debates raise a number of important research questions: How much money do governments, copyright owners, and intermediaries spend on copyright enforcement? How are resources focused on individual infringers versus intermediaries, domestic versus foreign infringers? What are the profiles of enforcement targets, including organized transnational criminal enterprises? What remedies are sought and applied? What are the effects of these efforts in terms of compensation, prevention, education, and deterrence? How is the effectiveness of enforcement efforts changing with advances in technology and ever faster digital networks? Are better and more effective enforcement technologies available today than were available when the DMCA was enacted? What new forensic

services and related vendors have entered the market? What are the costs and benefits of new enforcement mechanisms introduced in some sectors and jurisdictions, including enhanced secondary liability, "graduated response," filtering, domain blocking, and targeting of "rogue" websites? How are these costs and benefits distributed among copyright owners, developers and operators of platforms and technologies used for the dissemination of copyrighted works, public enforcement agencies, and other entities? How are distribution of costs and benefits shaped by the safe harbor provisions of the DMCA and related legal standards regarding secondary liability? Are there new business models that are less vulnerable to infringement and therefore less reliant on enforcement efforts? What is the role of voluntary inter-industry arrangements to reduce infringement levels? What legal impediments do such arrangements encounter and how can these be removed, lowered, or accommodated? What have been public reactions to increased enforcement efforts? And what is the speed of enforcement, especially in cases where infringement is obvious? In other words, how long can a flagrant infringer operate and profit?

Questions about enforcement overlap with questions described above regarding the motivations of copyright users and other participants in the copyright environment. Do enforcement efforts motivate users to acquire copies of works through authorized channels instead of via infringement? When do enforcement efforts hinder legitimate activities and technological innovation? Do enforcement limitations encourage enterprises that contribute to infringement to turn a blind eye to illegal activity they could help to prevent? To what extent should enterprises that facilitate consumer access to copyrighted content be held responsible for illegal activities carried out by users? Should this determination depend on their ability to control the activity in question?

Enforcement questions seem especially amenable to international comparative analysis. The international legal framework for copyright, consisting of treaties administered by the World Trade Organization (WTO), World Intellectual Property Organization (WIPO), and a multitude of bi-party and multi-party agreements, sets broad parameters and minimum standards for national copyright enforcement efforts. But the agreements allow for local variation in practice and countries comply with their terms differently. Although these characteristics represent opportunities for comparative analysis of enforcement regimes, to date there has been negligible comparative research assessing the cost and efficacy of different approaches and their effects on economic output and investment. A first-order priority is to compare enforcement practices over time in jurisdictions that have been relatively successful in reducing the prevalence of high-volume copyright infringement and those in which the problem has been more intractable. Further research could study how

these enforcement differentials have impacted local creators and other participants in the creative environment.

## EXCEPTIONS, LIMITATIONS, AND BALANCED COPYRIGHT DESIGN

As explained above, the exclusive rights that copyright law grants to encourage creativity can impose costs in terms of reduced access and cumulative creativity. The exceptions and limitations to copyright can be understood as attempts to contain these costs and maintain an overall balance in copyright policy. Fully evaluating copyright policy requires that we understand not only how well the law motivates creativity, and how well the rights it creates are enforced and transacted, but also how its limits operate. Copyright needs to be seen as part of a larger policy environment related to creativity and innovation, an environment that includes other mechanisms that may serve as complements or even alternatives for copyright's particular mechanism of promoting creativity.

One way copyright law balances competing interests is by term limitations; another is by permitting certain uses of copyrighted works without permission from their owners under various exceptions and limitations. These include some narrow exceptions that allow very specific uses of certain types of works by statutorily-identified classes of users. Other exceptions—including the fair use and first sale doctrines—are more generally applicable.

Valuable research could build upon initial attempts to quantify the benefits of exceptions and limitations in terms of the economic outputs and welfare effects of those individuals, businesses, educational institutions and other entities that rely on them. These include search engines whose practices (e.g., embedding thumbnail versions of copyrighted images in search results) have survived copyright challenges on the basis of fair use, for example; used book sellers and movie rental businesses that rely on the first sale doctrine; libraries that rely on fair use; publishers of books for which copyright has expired; and a variety of music outlets that rely on the complex scheme of limitations and compulsory licenses applicable to music copyrights. A variety of practices in the education and library contexts are also shaped by fair use, first sale, and other exceptions. Assessing the effects of copyright limitations would also require studying how, if at all, they affect copyright holders. Research should also aim to understand these benefits and costs dynamically, exploring how copyright and its limitations affect the emergence of innovative and/or disruptive technologies and platforms.

Limitations may also be affected by developments in technology and business practices. Where the sales of books to libraries are replaced by

limited grants of permission to access e-books, for example, limiting doctrines like first sale may be less effective than in the past. Research about how contractual practices are interacting with and perhaps displacing copyright's limitations and exceptions would be valuable to better understand this and other developments. Harder to quantify but nonetheless critical are the effects of copyright exceptions and limitations on individual welfare, autonomy, and freedom of expression, as well as the role of libraries and archives as cultural custodians, preserving digital books, journals, archives, datasets, music, and film for consultation, scholarship, and study.

## PRINCIPLES TO GUIDE RESEARCH

Finally, we want to reiterate two guiding principles of research on copyright. First, irrespective of whether their research relies on quantitative data collection or survey or experimental methods, investigators should consider undertaking studies that are comparative across countries, industries, and time. Cross-cultural comparisons should by no means be limited to enforcement questions. They should broadly explore how content is created, developed, disseminated, and used in countries with different copyright regimes as well as different levels of enforcement. Perhaps institutions such as the Organisation for Economic Co-operation and Development (OECD), United Nations Educational, Scientific, and Cultural Organization (UNESCO), and international scientific organizations can help address data access issues which are no doubt different than but possibly as challenging as they are in the United States. Cross-country comparisons pose a challenge to the researcher in understanding the political and social context of policy changes in each of the countries being studied. Likewise, cross-sectoral studies require an understanding of how each of the industries works. Neither challenge is insuperable and the reward is a richer understanding of the different policy choices and economic contexts.

A second principle that investigators as much as policy makers should bear in mind is that technological change will continue to drive changes in content creation, distribution, and consumption, including infringement. They should be attentive to technologies and trends that should prompt re-thinking of long-held assumptions about creativity and the logic on which copyright protection is based.

# 4

# Data Infrastructure for an Empirical Approach to Copyright Policy Research

Although the empirical research described in the previous chapter suggests that independent research on the copyright system's impact on creativity and innovation can provide significant insights for policy makers, the availability of such research is very limited; and for questions on which some research exists, it is clearly at an early stage of development. The paucity of independent research can be explained by many factors, but the committee's deliberations repeatedly returned to one key bottleneck—the quality and quantity of data across all of the principal content media—books, movies, recorded music, newspapers, and software. Categories include data on such matters as the costs of production, marketing, and distribution; prices of products and quantities sold; ancillary sources of revenue for creators such as live performances; consumption behavior; patterns of access, including unauthorized access, to copyrighted works; licensing terms and the efficacy of licensing arrangements; and the costs and efficacy of anti-piracy technologies and legal enforcement measures.

The situation with respect to copyright is analogous to discussions of the impact of the patent system some 15 years ago. There was no paucity of theory, but the difficulty of subjecting these theories to systematic and detailed empirical analysis meant that the debates went largely unresolved. There was even widespread skepticism that empirical research was feasible, let alone useful. This state of affairs has changed significantly over the past two decades. Most importantly, a number of key data sources were made available or created, spawning a diverse literature

on the operation and impact of the patent system. An important early effort was the establishment at the National Bureau of Economic Research (NBER) of the first publicly available patent dataset that incorporated both accessible patent citation data and links to Compustat data on individual firms (Jaffe and Trajtenberg, 2002). Extensive surveys of corporate R&D managers by researchers first at Yale University (Levin et al., 1987) and later at Carnegie-Mellon University (Cohen et al., 2000) provided the first systematic data on how patents are used relative to other means of creating competitive advantage in different industries. Public agencies such as the National Science Foundation and, in recent years, the U.S. Patent and Trademark Office itself, have taken further steps to expand patent-related data collection and analysis. A robust empirical research agenda in the copyright area will require data associated with the activities of very different stakeholders—originating artists, performers, companies that publish and disseminate copyrighted works—as well as much more detailed user data that capture patterns of digitized material consumption and distribution across population groups.

The availability of systematic data and the emergence of a community of investigators able to identify the strength and weaknesses of particular data sources for addressing particular issues were keys to an empirically oriented understanding of the patent system that has clearly influenced policy making in the area. The committee believes that creating a similar data infrastructure platform around copyright and enabling a community of investigators to study and engage directly in policy debates in the area of copyright would be immensely valuable.

Empirical copyright research has been undertaken in the past although not on a sustained basis. Issues similar to today's debates about anti-piracy measures arose at the dawning of the digital age over two decades ago. With the advent of digital audio tape (DAT) technology, the record industry and the consumer electronics industry diverged on the need for government intervention. Both sides produced consumer surveys and studies supporting their points of view. The non-partisan Office of Technology Assessment (OTA), created to provide Congress with authoritative analysis of complex technical issues, sponsored theoretical, empirical, and survey research that addressed consumer patterns as well as the concerns about infringing use of home recording technology. Although the legislation growing out of this work—the Audio Home Recording Act of 1992, P.L. 102-563, 106 Stat. 4237—was soon eclipsed by more effective digital copying and playback technologies (e.g., computer ripping of audio files from CDs and MP3 players), the OTA studies, in particular its consumer survey, provided an objective basis for anticipating consumer behavior and evaluating policy options (U.S. Congress Office of Technology Assessment, 1989).

The analogy to empirical patent research has limitations. Unlike the patent system, there is no comprehensive repository for copyrighted works. Measuring their value using sales or usage data is challenging because such data are either unknown, dispersed, or privately owned. Owing to the vast, decentralized, and often private nature of the data, the costs and benefits of the collection process are often difficult to know. In some cases, such as orphan works, it is simply infeasible. Thus, before describing some types of research projects that might be profitably undertaken, we outline in this chapter both key opportunities and formidable challenges associated with acquiring and using data related to copyright and identify some promising data resources to support policy-relevant empirical studies.

## OPPORTUNITIES AND CHALLENGES ARISING FROM DIGITAL TECHNOLOGY

Copyright policy is most contentious and in flux in the digital realm. The introduction of CDs, DVDs, MP3 files, UGC websites, web-based content aggregators, and now streaming music and radio have all created challenges for the interpretation and enforcement of copyright law not only in the music industry but also in other copyright-intensive industries such as newspapers, software, and film. Digital technology also enables rapid changes in the nature of consumption, which can expand rapidly in new areas and contract just as swiftly in others.

The implications for data collection are also profound. Most promising, the process of digitizing and digitally distributing expressive works generates a digital data trail that can then be used by researchers to study copyright policy. File-sharing is a prime example. By its design file-sharing software requires an accounting infrastructure that keeps track of users connected to the system, including their location, operating system type and speed, as well as information on which files are being shared by whom in what way. These data are ostensibly public, although collecting, organizing, and making data amenable to systematic research takes considerable effort. Several studies have collected different chunks of such file-sharing data and use it to telling effect. Such direct comprehensive data-based analysis of music sharing would have been impossible in a world where users swapped CDs and purchased bootleg copies from local dealers.

Although infringing use of music has been the phenomenon most thoroughly studied using this digital data trail, it is not inconceivable that similar methods could be applied to other industries as they become increasingly digitized. E-books provide a prime example. In a world where readers increasingly consume written content on digital devices,

usage data now exist that would have been prohibitively expensive to collect in the analog age. Software logs routinely collect information not only on sales of books downloaded from centralized repositories like Amazon, but also information on if and *when* a particular book was read, how *quickly* it was read, and so forth. Similar analyses could be done on e-magazines and blogs where it is now possible to measure time spent on a particular article or blog-post, and click-through rates of particular hypertext links. In the context of streaming video, YouTube and Netflix collect data on user behavior including repeat consumption and the location and time of consumption. All of this information, if routinely collected by private and public entities and systematically organized, would be invaluable to the study of copyright in the digital age, as well as other aspects of the digital economy. Of course, proper use of this data will require taking steps to protect the privacy of consumers.

On the other hand, collecting such microdata for research remains a considerable challenge. Perhaps the biggest challenge lies in the fact that data about the creation, consumption, and distribution of digital media increasingly reside in the hands of private entities whose incentives diverge from those of researchers. Even if such data were available, constructing pseudo-experimental research designs places an additional burden on data when, as is usually the case, researchers are unable to directly run experiments. Finally, the problem of "free" goods is particularly salient in the digital domain. E-magazines and blogs are often free to read, free applications for smartphones abound, and free music and video are widely available. In such cases, it becomes hard to place a dollar value on such goods, compounding the difficulty of estimating consumer or producer surplus in these industries. This section highlights the practical and conceptual challenges inherent in the collection of digital copyright-related data and its use in carefully designed research.

### Incentives of Data Owners

Data collection can be costly. Firms and industries have some motivation to collect such information in the pursuit of profit maximization and industry-focused advocacy. To out-compete rivals they will want to keep some information proprietary, but in some cases they will be open to selectively sharing data that will help their industry in policy advocacy. They might also design studies and surveys to shape public or political elite perceptions in ways that favor their policy agenda. The home recording controversy described earlier is a good example. What private data holders do not have at present is an incentive to act in concert to share data with researchers whose results they do not control.

These challenges will undoubtedly persist as the Internet and digi-

tal technologies continue to evolve. For that reason, we believe that the policy agenda must begin with a multi-faceted, robust, broad-based, forward-looking data collection foundation.

## Challenges of Research Design

Even if some of the adverse data-sharing incentives of data owners could be negotiated, credible research requires well-conceived research designs. The ideal approach is to experimentally subject a treatment group to a particular policy while leaving another, similar "control" group untouched, then to estimate the impact of the policy using relevant outcome variables. This simple comparative approach would work if we could experimentally expose, say, half a population to an opportunity to engage in infringing use of copyrighted content. But this may not be feasible. We assume that the people we would observe engaging in infringement are likely those with a high level of interest in the work. However, research into whether this assumption is valid may be a threshold step in this inquiry. For example, it may be that some people access the work without authorization merely for the purpose of skimming, sampling, or other initial inquiry much as one would use a précis, index, or other aid. Gaining access to data while simultaneously implementing a credible research design is often a considerable challenge. Nevertheless, the more data collection is expanded, the more it will be possible to implement better research design. (Angrist and Pischke, 2008).

The copyright context may well be a source of pseudo-experimental comparisons. As a general rule, books and musical works published in 1923 are now in the public domain while some works produced a year later are not, making it possible for simple comparisons to provide important insight into the effect of copyright although this may be complicated by the fact that there are often several editions of the same title. If copyright protection inhibits use—or if being in the public domain promotes over-use—then the works still under copyright protection should see less use. As useful as this insight may be, a researcher of course still needs data on usage or other outcomes of interest. In particular, careful research designs must reflect the fact that copyrighted material is heterogeneous and ensure that "apples to apples" comparisons are being made when the objective is to determine the impact of copyright law on the creation, diffusion and use of those works.

## Free Goods

The challenges of incorporating the impact of digital technology into GDP are particularly troublesome in the case of digital goods and services

whose price is zero. To see why, consider the usual approach to adjusting for quality. Suppose that technical change has allowed the price of lettuce to fall from $3.50 to $2.00 from 2009 to 2010 and that demand is perfectly inelastic, i.e., the quantity remains constant. While the total nominal sales of lettuce would decrease from 2009 to 2010, we can easily make a price index adjustment. Using the 2009 prices for the same good, GDP would have been higher, and so we can use these quality-adjusted prices to characterize the impact of technical change on the lettuce industry.

If a good that formerly had a price becomes free, however, there is no procedure for incorporating it into GDP statistics. Suppose that in 2009, there were many sales of music CDs, but by 2010 consumers relied exclusively on infringing downloads, possibly in much higher volume. As customers download music without cost from the Internet in place of purchasing music CDs, both the price and quantity of music purchases disappear from GDP calculations. There is no simple price adjustment that will allow us to link the 2009 and 2010 distribution and account for the change in price. Instead, the entire category of music sales simply disappears from the GDP estimation. A concrete example is the decline in sales of printed encyclopedias, initially attributed to the rise of Encarta, which was recorded as a drop in GDP, while the rise of Wikipedia, which displaced Encarta, is absent from the GDP statistics. Similarly, there is no direct accounting in GDP for the rise of online media services such as the *New York Times* or *Washington Post* except for the indirect sales generated through advertising revenue. This mismatch in the quantity of digital output and its mis-measurement in copyright-relevant industries makes empirical analysis extremely hard to implement.

Despite the formidable challenges of measuring the value of free goods, their increasing importance in many digital contexts requires that new research methods be developed and implemented. Contingent valuation, randomized control trials, and quasi-experimental settings are all potential methods for helping to determine what value consumers and other stakeholders ascribe to free goods on the Internet. Companies like Google have been measuring and benchmarking the impact of digital content. A website's PageRank or reputation on the Web translates into how much attention or time it can expect to get from consumers, which translates into how much ad revenue it can demand from advertisers. These links fall short of scientific rigor, and it is debatable whether ad revenue captures all the values and if not, what the correct methodology should be.

## Measuring the Impact of Digital Technology

Many of the topics in copyright policy research require measuring some aspect of the transition to a digital age. The measurement questions are central in some cases, secondary in others; but measuring the emergence of digital technology is an underdeveloped field attracting a level of effort woefully small in comparison to its social and economic importance. A very large scale government enterprise measures GDP, the flow of pecuniary goods and services. The shifts toward digital goods and digital distribution command attention nothing like it in scale or sophistication.

The symptoms of underdevelopment are apparent in many aspects of U.S. policy. For example, the recently issued 360-page National Broadband Plan contains information from only a few statistical studies authored by neutral third-parties, primarily academics. It contains little in the way of statistical analysis of the consequences of various policy options. This is not attributable to inadequate staff effort but reflects the inchoate state of economic research about digital infrastructure and digitization more broadly, in particular, the absence of an organized community of researchers with a large and well developed body of knowledge.

So incomplete a data foundation would be unthinkable in other infrastructure contexts. Every congressional bill supporting transportation infrastructure, for example, is accompanied by a forecast for the economic growth it will generate and the number of jobs it will create. Nothing comparable can be done for legislation shaping the information infrastructure because there is not even a simple measure of the size of the digital economy nor any apparatus in place to project its growth.

Many initiatives to improve measurement of the digital economy were launched in the 1990s—at the Bureau of Economic Analysis, Census Bureau, Bureau of Labor Statistics (BLS), and the National Telecommunications and Information Administration. A few of these have survived, for example, a survey about the labor market for information technology workers, and an estimate of the scale of electronic commerce, called E-Stats. Others did not survive, however—for example, household and business surveys of broadband supply, adoption, and use.

Unlike in other developed countries, the best information about the online behavior of the U.S. population came not from a government-sponsored survey but instead from a private foundation, the Pew Internet and American Life Project. Although the Pew survey has been useful, especially in tracking social behavior online, its scale is limited, ranging from a little more than one thousand to several thousand households at a time. With these sample sizes the survey could only gauge general trends and gain some insight into their variance. It is incapable of achieving what the BLS survey, involving 80,000-100,000 households, does well—providing a

picture of variance across populations in different regions with different gender, age, skill level, educational, and ethnic profiles.

## WHAT DATA ARE NEEDED AND AVAILABLE, ACCESSIBLE, OR COULD BE CREATED?

Public discourse about copyright would benefit from a range of innovative institutions contributing to measurement efforts. What types of publicly accessible databanks would contribute to research efforts? What standards for data in this area would contribute to building further research? What data remain locked in proprietary vaults but could be unlocked by a standard process for protecting privacy while informing research? What is not being systematically measured but could be?

Assessing the health of the copyright system requires, at a minimum, documenting both the supply side and the demand side of the market for each content area—books, movies, recorded music, newspapers, software, etc. On the supply side, this means determining the number of products, and new products, available in each year, and the prices of each of the products. Generally a harder task is quantifying the consumer side of the market, not only the quantities sold but also the amount of use that each product gets. Harder still, but vital for answering important policy questions, is ascertaining the volume of unpaid use of each product over time. Because many copyright industries derive much of their revenue from ancillary activities, it would be useful to know about revenue flows to producers from these activities, including, for example, live performance revenue for musicians and speaking fees for authors. With data of these sorts, one could begin to address the following questions: What has happened to revenue? To what extent has unpaid consumption displaced sales? What has happened to the flow of new creative works?

To study the role of each agent in the digital economy—creator, marketer, distributor, and consumer—three categories of data are needed. These include data that are currently available to the public but not extensively studied in the context of digital technology; data that exist but for whatever reason are not available to the general public; and data that do not currently exist but can be created.

### Existing Accessible Data

We have found a wide range of data sources from government agencies to private institutions that can be used to measure the impact of copyright in the digital age. Most of the data are published on an annual or quarterly basis, although a few reports have been released on a one-time basis. First, we will examine data related to Internet use in general from

public and private institutions. Then we will look at the relevant data sources for digital copyright in particular. See Table 4-1 for an annotated bibliography of these data sources.

The most comprehensive public domain report on the behaviors and demographics of Internet users is the Federal Communications Commission's High-Speed Services for Internet Access, which focuses on the status of broadband in the United States. It shows the number of consumers connected on broadband through DSL, cable modem, FTTP, and satellite. The report further breaks down each population group into seven tiers both in terms of upload and download speeds. It also includes a geographical mapping of connection speeds on a state-by-state basis.

The Pew Research Center publishes an annual report that shows the number of Internet users by gender, race, age, household income, education, and community type. This report includes data on broadband and wireless penetration as well as the percentage of Internet users who carry out certain activities online such as reading the news or playing games. Together, the Federal Communications Commission and Pew reports describe some aspects of the user dynamics of the digital world and have the potential to model different aspects of consumer behavior online.

Private firms collect a great deal of information on products, prices, and volumes of paid consumption (see Table 4-2). Nielsen, for example, collects very detailed data on the quantities of books and music recordings sold as far back as 2001 in the case of books and the 1990s in the case of music. Nielsen also conducts a quarterly survey, the A2/M2 Three Screen Report, that tracks the penetration of broadband, HDTV, DVR, and smartphones. In addition, the report contains the number of users for and the hours spent on TV, Internet, and mobile phones broken down by age demographics. Although some researchers have gained access to Nielsen data, they have not been widely used because of the restrictive terms on which they are available.

Movie box office revenue data are available from the Internet Movie Database (IMDb) and Box Office Mojo, among other sources. Information on sales of discs is available from Opus and other providers. The RIAA now provides substantial data on its member companies' current and historical sales activity.

Perhaps the biggest void is data on the volume of unpaid consumption, yet that, too, is changing. Big Champagne has tracked the popularity of copyright-protected works through unpaid distribution channels for a decade. And Google's recently developed Transparency Report portal provides real-time and historical data on take-down and user data requests.

Another regularly published report, by the International Data Corporation (IDC), shows the size and growth of digital data over time. The

TABLE 4-1 Data Requirements for Copyright Analysis: An Illustrative Framework

| | Supply | Demand |
|---|---|---|
| Music | • data on new records, music tracks including professional, semi-professional, and amateur recordings<br>• number of concerts (with details on venues, capacities, etc.)<br>• information on quality of new music recorded<br>• copyright status of recorded work | • number of new tickets sold<br>• music video plays on YouTube and elsewhere<br>• radio airplay and listening times (including online streaming services like Pandora and Spotify)<br>• record and Internet sales data<br>• data on unauthorized use |
| Performance Artists | • information on the careers, activities, and income of dancers, performers, musical artists, etc. | • Information on the consumption of artistic performances of various types, and the impact of digitization on that. |
| Original artistic productions | • information on the careers, activities, and income of originating artists including fine artists, architects, designers, sculptors, etc. | • information on the consumption of art by museums, collectors, galleries, corporations and the general public |
| Scientific papers and research reports | • data on scientific researchers<br>• data on the activities and finances of scientific publishers | • data on use of prior research by scientific researchers, by professional practitioners who rely on scientific findings (e.g., physicians), and by the general public |
| Movies | • data on new movies, video clips released<br>• quality measures of new video content<br>• copyright status of recorded work | • data from videos taken down from YouTube, Ustream and other video content sites<br>• cinema attendance numbers<br>• home movie watching including internet purchases, video rentals, streaming movie services, set-top box consumption, etc.<br>• data on unauthorized use |

TABLE 4-1 Continued

| | Supply | Demand |
|---|---|---|
| Software | • data on the amount of software produced, value of such software, and its diffusion in various formats | • data on the use and extension of software by users in both the private and public sectors<br>• data on user-generated software, including software from open source movement |
| Content | • data on publication of new content, by publication type (magazine, newspapers, blogs, websites, etc.)<br>• copyright status of work | • readership figures<br>• time and money spent in consuming content<br>• ad revenue for publishers<br>• data on unauthorized use |

numbers include both historical values and future projections as far into the future as 2020. The report shows the cost of information management, the percentages of Internet data that require various levels of security, and the number of people using social networks. The State of the Internet is a quarterly report published by Akamai that provides country-level Internet data. The statistics include Internet attack traffic, average connection speed, and number of unique IP addresses. The same data is available on a state-by-state basis for the United States.

Some copyright data from government and academic institutions have not yet been analyzed. The online U.S. Copyright Office Database contains roughly 20 million records of works registered since 1978 by creators of books, music, films, maps, software, etc. Each record contains the date of creation, date of publication, and basis of the copyright claim. Pre-1978 Copyright Office records are being digitized back to 1923. Another source of copyright data is the Stanford Copyright Renewal Database, which contains renewals of copyrighted books between 1950 and 1992. Each record shows the title, author, renewal date, and renewing entity.

Another category of government data, important for understanding copyright enforcement, is civil infringement suits filed in U.S. Federal District Courts and criminal prosecutions for infringement. This provides a record of plaintiffs, defendants, and judgments for cases that proceed through litigation. A private firm, Lex Machina, is preparing copyright litigation data in a form that should be useful to researchers.

We have also identified data in the private sector that can advance our understanding of the impact of copyright laws. The RIAA publishes an annual Music Consumer Profile report that estimates the market size

TABLE 4-2 Existing Data Sources and Stakeholders

| Agents | Database Name | Source | Frequency |
|---|---|---|---|
| Consumers | A2/M2 | Nielsen | Quarterly |
| Consumers | The Diverse and Exploding Digital Universe | IDC | One-time |
| Consumers | The Digital Universe Decade | IDC | One-time |
| Consumers | High-speed services for Internet access | FCC | Semi-annual |
| Consumers | Survey data | Pew Internet | Annual |
| Consumers | Soundscan Social Media Report Television Report | Nielsen | Ongoing |
| Creators | Copyright records | U.S. Copyright Office | Ongoing |
| Creators | Copyright renewal database | Stanford University | One-time |
| Distributors | 10-K and 10-Q reports | Media distribution companies | Annually and quarterly |
| Copiers | Digital Music Report 2010 | IFPI | Annual |
| Regulators | Music Consumer Profile | RIAA | Annual |

| Description |
|---|
| • Analyzes consumer behavior on video related media including TV, Internet, and mobile phones. Discusses what consumers watch, how much time spent, and how trends are changing.<br>• http://en-us.nielsen.com/main/insights/nielsen_a2m2_three |
| • Calibrates size and growth of digital data through 2011.<br>• Also explores the impact of scientific industries as well as the environmental footprints of digitization.<br>• http://www.emc.com/collateral/analyst-reports/diverse-exploding-digital-universe.pdf |
| • Estimates the size and growth of the digital universe through 2020. Also looks at the cost to manage information, security issues, and the prevalence of social networks.<br>• http://www.emc.com/collateral/demos/microsites/idc-digitaluniverse/iview.htm |
| • Provides summary of subscribership data filed by annual providers of high-speed services. Includes details about subscribership differences among census tracts.<br>• http://www.fcc.gov/wcb/iatd/comp.html |
| • Shows the current demographics of Internet users and the activities they do online. Describes the frequencies of Internet activities.<br>• http://www.pewinternet.org/Data-Tools/Download-Data.aspx |
| • Overall sales and viewership figures on a variety of media platforms, including CD, DVD, consumption of social media, etc. Scattered across multiple reports and Nielsen channels |
| • Catalogs all registered books, music, art, periodicals, and other works. Includes the date of creation, basis of claim, previous registration, and claimant.<br>• http://www.copyright/gov/records/ |
| • Creates a searchable copyright renewal records for books published between 1923 and 1963. Contains information on renewing entity, renewal date, and registration date.<br>• http://collections.stanford.edu/copyrightrenewals |
| • Includes financial data such as net income, revenue, and cost of goods sold. Also discloses special events such as CEO departure, bankruptcy, and business risks. Available on company websites and from financial information services. |
| • One measure of the incidence of global music revenue and the impact of unauthorized use across different domains. Imperfect sales suggest that the decline in global music revenue is a result of unauthorized use with certain regions suffering more than others.<br>• http://www.ifpi.org/content/library/DMR2010.pdf |
| • Provides benchmark on genre, format, age, and gender of music consumers. Estimates the overall size of the music industry.<br>• http://www.riaa.com/keystatistics.php |

*continued*

TABLE 4-2 Continued

| Agents | Database Name | Source | Frequency |
|---|---|---|---|
| Regulators | The State of the Internet | Akamai | Quarterly |
| Regulators | Fair Use on the Internet | Library of Congress | One-Time |
| Researchers/ Inventors | Web of Science | Thomson Reuters | Ongoing |
| Researchers/ Inventors | USPTO Patent Database | USPTO | Ongoing |

for the industry. The market figures are broken down by genre, format, age and gender of consumer, and channel of sales. In addition, music recording companies publish annual financial 10-K reports that contain profit margins and revenues numbers. The same is true of publicly held companies in other copyright-intensive industries such as film, publishing, and software. These data can shed light on the stakes involved for copyright regulation.

Lastly, there are one-time reports published by government institutions and special interest groups to address the issue of digital copyright. The Library of Congress published the Fair Use on the Internet report in 2002, which contains a list of court cases that can help define what is considered fair use and what is not. The International Federation of the Phonographic Industry (IFPI) Digital Music Report 2010 estimates the revenues lost due to music infringement in select countries around the world. Estimates include global revenues for games, music, films, newspapers, and magazines. The report also provides a list of legal music providers for each country.

### Existing Data with Limited Access

Massive amounts of copyright-related data exist but are not readily available for public use for multiple reasons. For example, the records of customer purchases on eBay or Amazon.com can be used to study online consumer behaviors. Due to privacy issues, these data are not easily accessible by research institutions and have limited use even for keepers of the

| Description |
|---|
| • Includes data gathered across Akamai's global server network about attack traffic, connection speeds, Internet penetration and broadband adoption. Also aggregates publicly available news and events.<br>• http://www.akamai.com/stateoftheinternet |
| • Assesses the merits of the fair use argument for actions on the Internet. Highlights the difficulty in creating a general guideline for fair use on the Internet.<br>• http://www.fas.org/irp/crs/RL31423.pdf |
| • Scientific publications and citations<br>• http://thomsonreuters.com/products_services/science/science_products/a-z/web_of_science/ |
| • scientific publications and citations<br>• http://patft.uspto.gov/ |

data. Another example is the amount and content nature of peer-to-peer file transfers that take place over the Internet. Some of that information exists on peer-to-peer network servers that are operating in questionable legal realms and some on individual personal computer hard drives. For these types of data, the first challenge is simply to identify the sources, then to overcome the legal barriers to access, and agree on protocols to protect privacy, and finally, to aggregate the data into one place.

### Currently Non-existent Data

A full understanding of the digital economy will eventually require collection of additional data that currently do not exist. These data may not be quantitative or even quantifiable. In the Internet realm, with little control and regulation, the data collection process presents many technological challenges. Examples of such data of interest include systematic measures of copyright enforcement, radio playlists for all stations, and licensed use of musical works in television and movies.

### Closing the Gap

We have three suggestions to advance research to inform evidence-based policy making. First, we need to attract social science researchers' attention to the questions we have identified. By forming a cohort of researchers from a wide variety of disciplines and by supporting them

with a robust and comprehensive data infrastructure we can make significant progress on a wide variety of policy issues relevant to copyright.

Second, public and private grant-making organizations should support research that builds the data infrastructure that would support research in this area. They could convene a representative group of researchers, for example, under the auspices of NBER, to further identify, characterize, and prioritize data sources. Funding agencies could then assist researchers in negotiating access to such data and in some cases fund their acquisition from industry stakeholders, perhaps through a research consortium. In many cases, private firms hold data that may be recent enough for some research purposes but obsolete commercially. They might be induced to release these to researchers on a rolling basis.

Third, as we have observed, the federal government needs to expand the collection of data on the digital economy as well as on intangible assets such as intellectual property holdings and their use. This should take several forms. First, agencies such as the Bureau of Labor Statistics and the Bureau of the Census should consider adding copyright-related information to regularly conducted surveys of businesses and consumers. One prime example would be revising the Bureau of Labor Statistics Time Use Survey to address questions of digital consumption in a contemporary way. In the current survey, there is no measurement of time spent listening to music exclusively rather than in combination with other activities. Although private sector sources of data are important, as we have noted, there are significant limitations of current surveys, and the availability of such data is limited for researchers. The Bureau of Economic Affairs of the Commerce Department has very limited resources to acquire the types of business data described above that could be extremely useful in understanding the landscape of intangible assets.

The committee proposes a more ambitious approach. Agencies such as the Bureau of the Census, Bureau of Economic Analysis, National Science Foundation, U.S. Patent and Trademark Office, and the Copyright Office should form an interagency group that, along with expert advisors, would study the advisability and feasibility of an ongoing and systemic national business survey of intellectual property. Like the Business R&D and Innovation Survey (BRDIS), the IP survey would include samples of businesses in the service and manufacturing sectors. It would probe uses (e.g., licensing) and holdings of intellectual property and costs of acquisition and maintenance. Because of the nature of the production of digital goods, including the prominence of user-generated content, the business survey should be complemented, if at all feasible, by a detailed consumer survey of user-generated content and use. This would include, among other things, measurement of the amount of production and distribution of digital content by non-business entities (i.e., by users), and also mea-

surement of the consumption of such content by both business and the population at large.

Unlike BRDIS, these surveys could be conducted periodically, such as every five years. The Bureau or the National Science Foundation would issue periodic reports of aggregated data, but detailed data would be available to qualified licensed researchers on the same basis as other business confidential information, through the Census data centers. Such survey data could never provide data to answer all of the research questions we pose in Chapter 3 but would be a considerable advance on the status quo, greatly contributing to our ongoing efforts to better understand the stock and flow of intangible assets in the economy.

We cast this proposal as a study recommendation because of the constraints of our charge and limitations of our expertise. Although a survey would be especially important for understanding copyrights because of the lack of a formal registration requirement, it would make little sense to mount a survey of copyrights alone, neglecting patents and trademarks. Nevertheless, other forms of intellectual property are outside our statement of work. Equally important, we are not in a position to judge two very important considerations that could render either or both surveys impracticable—the burden they would impose on respondents (e.g., the need for businesses to conduct patent and copyright searches) and the resources needed by agencies charged with carrying them out. The federal statistical agencies generally are tightly budget constrained and having to cut back activities.

The gap between what would be ideal in terms of data requirements for a thriving research agenda around copyright and what exists currently is large. Building easily accessible and comprehensive datasets relevant to the study of copyright-relevant industries is crucial for the development of a research community based around copyright issues. We hope the categories of data described in this chapter will help focus efforts to obtain and create high quality datasets for addressing some of the key policy questions described in this report.

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# Appendix A

# A Copyright Primer

For those readers less familiar with the development of copyright, this appendix describes how the basic logic of copyright is reflected in the structure and evolution of the law. We focus on U.S. law, with some attention to how it fits into the international copyright system.

## ORIGINS

The precursors of modern copyright protection trace back to the invention and diffusion of the printing press in the second half of the fifteenth century, which dramatically expanded the size and competitiveness of the potential market for copies of books. In the fifteenth and sixteenth centuries, European governments obliged the emerging printing industry by granting individual printers exclusive privileges to print specified books or classes of books. It was not until the passage of the Statute of Anne in 1710, however, that the English Parliament enacted the basic features of modern copyright protection: exclusive but transferable rights for *authors* of printed works to print, reprint, and sell those works for specified times, all for the purpose of "the encouragement of learning."

Most U.S. states, shortly after gaining their independence, enacted copyright laws modeled on the Statute of Anne, but with significant variation. Problems with applying these different laws across state borders led to a consensus that a national law was necessary. Among the first enactments of the first United States Congress was the Copyright Act of 1790. Authorized by the constitutional directive "to Promote the Progress

of Science and the Useful Arts" and modeled on the Statute of Anne, the Copyright Act granted authors or their transferees protection though remedies of forfeiture and monetary penalties against infringing "print[ing], reprint[ing], publish[ing], and vend[ing]" of books, maps, and charts for 14 years and allowed renewal for a second 14-year term.

Like other legislation of this era, Congress left many of the details to be fleshed out by the courts. As a result, many essential elements of copyright protection, such as infringement standards and defenses, developed through judicial decisions. Some of these doctrines were later codified, but many continue to exist solely in case law. Private copyright-related institutions and transactional practices and technology for creating, copying, and distributing works are also important contributions to the evolution of the copyright policy environment as we describe below.

## EVOLUTION

Advances in the technologies for creating and distributing works of authorship have played a critical role in shaping copyright law starting in the nineteenth century and continuing to today. As technology for making and reproducing works of authorship has expanded and the arts have flourished, Congress has repeatedly amended the Copyright Act to extend to new media and means of exploitation.

The domain of copyrighted works expanded over the course of the nineteenth century due to technological advances, changes in the creative market, and resulting changes in the scope of protectable subject matter. The publishing industry experienced explosive growth, with innovations in technologies for embodying artistic expression, such as the invention of photography. Whole new categories of works were created with Congress and the courts expanded protection to cover them. As the Supreme Court would later observe, "[a]s our technology has expanded the means available for creative activity and has provided economical means for reproducing manifestations of such activity, new areas of federal protection have been initiated" *Goldstein v. California*, 412 U.S. 546, 562 n.17 (1973).

Over the course of the nineteenth century, the nature of the exclusive rights granted by U.S. copyright law changed from the initial relatively narrow rights to print, reprint, publish, and vend. Some of this change occurred in the courts whose decisions were later codified in subsequent statutory amendments. In 1856, copyright holders' exclusive rights were expanded by statute to cover the right to publicly perform dramatic works. In 1870, translation and dramatic adaptation were added to the Copyright Act. In 1897, a public performance right was added for dramatic musical compositions. The process of judicial development and legislative codification also included limitations to the scope of copyright.

The fair use doctrine, for example, now set forth in Section 107 of the Copyright Act, traces back to Justice Joseph Story's seminal 1841 decision in *Folsom v. Marsh*, 9 F. Cas. 342 (C.C.D. Mass. 1841).

### 1909 Act

Congress comprehensively overhauled the Copyright Act in 1909. Building on the more modest amendments of the prior half century, the 1909 Act broadened the scope of copyright protection. It defined copyrightable subject matter to encompass "all the writings of an author." It added to the copyright holder's exclusive rights the right to "make any other version[s]" of literary works. The 1909 Act doubled the duration of copyright protection and codified two important doctrines that had been recognized in the copyright case law. The 1909 Act's "work-for-hire" provision specified that "the word 'author' shall include an employer in the case of works made for hire." The 1909 Act also codified the "first sale doctrine," providing that the owner of an authorized copy of a copyrighted work may distribute and display that copy publicly notwithstanding the copyright owner's exclusive rights.

The increasing scope and complexity of copyright law in the early twentieth century interacted with efforts by private parties, some of them government encouraged, to manage those rights through contractual and institutional mechanisms. The foremost example of innovative private ordering was the formation in 1914 of ASCAP for the purpose of enforcing the public performance rights that had been created in 1897. After initiating a series of lawsuits to confirm their right to object to the performance of their compositions in restaurants and similar venues, ASCAP established a blanket license that alleviated the transaction costs that might otherwise have made it difficult for those venues and later radio stations to license the rights to perform a wide variety of musical compositions owned by publishers and individual composers.

### 1976 Act and Related Reforms

Through the middle of the 20th century, advances in technology for creating and distributing works of authorship—most notably, sound recording and broadcasting—as well as anachronisms of the 1909 Act periodically aroused interest in reforming the copyright law. In 1955, Congress funded the Copyright Office to undertake a series of studies aimed at assessing the copyright system and set in motion an effort aimed at comprehensive reform of the statute through negotiation among government officials, the principal interest groups affected by copyright policy, and scholars. The reform efforts stalled in the mid- to late 1960s. Although

a more comprehensive reform was delayed, Congress did proceed with a narrower change to the law. It provided copyright protection for sound recordings in 1971. Finally, after two decades of study, negotiation, and debate, Congress approved the 1976 Act, which continues to serve as the principal framework for copyright protection in the United States.

The 1976 Act expanded the scope of copyrightable subject matter to any original work of authorship fixed in a tangible medium of expression, thus spanning the broad range of literary and artistic expression including literature, music, dance, sculpture, graphics, painting, photography, sound, movies, and computer programming. The Act established a new trigger for protection of these works, replacing publication with mere "fixation" of an original work in a "tangible medium of expression" and relaxing formal registration requirements. The Act thus made copyright protection easier to acquire. It also extended copyright duration. The 1976 Act replaced the dual term of protection with a unitary term that lasted in most cases for the life of the author plus 50 years, 75 years in the case of anonymous works, pseudonymous works, and works made for hire.

The comprehensive reworking of the copyright law also introduced new language defining copyright protections:

*Reproduction*. The owner has the exclusive right to make copies of the protected work. Courts have interpreted this to mean that the owner may sue a copier for infringement if the copying is "substantial," even if the copy is in a different form or is only part of the whole.

*Derivative Works*. The owner has the exclusive right to prepare derivative works, which are works based on the original but in different forms or otherwise altered (e.g., translations, movies based on books, etc.). These derivative works are themselves copyrightable to the extent that they contain original expression. Note that the right to create derivative works is closely related to the right to reproduce and employs essentially the same standard for infringement.

*Distribution*. The owner has the right to control the sale and distribution to the public of the original and all copies or derivative works. However, this right extends only to the first sale of such works. The owner does not have the right to bar resale or lending by purchasers of her works except in certain limited circumstances, such as rental of sound recordings.

*Performance and Display*. The owner has the right to control public but not private performance and display of her works, including both literary and performance-oriented works. This right extends to computer programs and other audiovisual works. The owner generally does not, however, have the right to prevent the display of a particular original or copy of a work of art in a public place.

The 1976 Act codified and expanded limits on the rights of copyright holders. It clarified that protection does not extend to any "idea, procedure, process, system, method of operation, concept, principle, or discovery" embodied in protected works, but only to their expression (17 U.S.C. §102(b)). It preempted most state and common law protections that overlap with federal copyright protection, established several new compulsory licensing regimes, approved numerous exemptions from liability for specified users and uses, and codified the fair use doctrine that had developed in the courts. Congress explicated the doctrine's general contours—to create leeway for criticism, comment, news reporting, teaching, scholarship, and research—and set forth a multi-factor test to determine whether use of copyrighted material should be permitted without the owner's authorization.

The 1976 Act also included several provisions regarding the transferability of copyrights, more fully acknowledging the variety of mechanisms by which authors may transfer or simply share their rights in whole or in part. A new provision ended a doctrine known as "indivisibility" and enabled authors to execute outright transfers via a signed written instrument of one, some, or all of their exclusive rights, which can then be transferred again by subsequent owners. Authors and subsequent owners may also grant nonexclusive licenses that merely authorize uses that copyright law otherwise secures to them, without transferring their copyrights. The Act also granted authors an inalienable right to reclaim copyrights 35 years after transfer.

### Berne Convention Accession

As the global content market expanded in the 1980s, the United States became the last major industrialized country to join the Berne Convention for the Protection of Literary and Artistic Works. U.S. accession heralded important changes in the fabric of the U.S. copyright system by making compliance with formalities (registration of works with the government)[1] discretionary, introducing a narrow concept of the continental doctrine of "moral rights," and restoring copyright for qualifying foreign works that had lost protection in the United States for failure to comply with formalities. In 1994, with the conclusion of the Uruguay Round of multilateral trade negotiations, the United States implemented the Agreement on

[1]Under the Copyright Act of 1909, which governs works published with proper notice prior to 1978, copyright registration was not required during the first term (28 years) of protection. Registration was required to obtain a renewal term during the 27th year of copyright susbsitence. That renewal registration requirement was abolished in 1992. Formal registration has never been required for works created after 1978, although the Copyright Act encourages registration through enhancement of remedies and procedural advantages.

Trade Related Aspects of Intellectual Property Rights (TRIPS). The TRIPS Agreement led to some substantive changes to U.S. copyright law—such as restoration of U.S. copyright protection for foreign works that had been injected into the public domain as a result of failure to comply with formalities—and subjects the United States, like other members of the WTO to mandatory dispute settlement for domestic copyright provisions, including judicial decisions, that may be deemed inconsistent with treaty obligations.

## THE DIGITAL AGE

By the early 1990s, advances in digital technology were beginning to be felt in the major content markets. The traditional content industries believed that widespread availability of technology for making and distributing low-cost, perfect copies of digital media could undermine their ability to enforce their rights. In response, Congress passed several detailed amendments to the Copyright Act aimed at reforming copyright law for the digital age. The Audio Home Recording Act of 1992 regulated the design of now largely obsolete digital audio tape technology and imposed a levy on the sale of devices and blank media to compensate copyright owners for losses from home copying. The Digital Performance Right in Sound Recordings Act of 1995 afforded owners of sound recordings a basis for earning income on digital streams of their works. The No Electronic Theft (NET) Act of 1996 expanded criminal enforcement for piracy over digital networks. The Digital Millennium Copyright Act (DMCA) of 1998, implementing two international treaties, afforded copyright owners rights against those who circumvent copy protection technologies subject to several exceptions and limitations, and insulated online service providers from liability for infringing acts of their subscribers. In 1998, Congress also added an additional 20 years to the duration of copyright protection. The Digital Theft Deterrence and Copyright Damages Improvement Act of 1999 significantly increased statutory damages for the infringement of copyright.

## COMPARING THE COPYRIGHT AND PATENT REGIMES

Although the copyright and patent laws flow from the same constitutional text and share the same general approach—statutorily created exclusive rights—they reflect very different fields of endeavor. Copyrights are generally easier to secure and last substantially longer than patents, although the scope of protection afforded copyrights is far narrower than that given to patents.

In contrast to patents, the exclusive rights under copyright law are

subject to far more exemptions as well as statutory licenses. Copyright law protects only against copying and distribution of protected expression, some public performances or displays of copyrighted works, and the unauthorized creation of derivative works. Thus, independent creation of a copyrighted work does not violate the Copyright Act, nor does copying the unprotected elements of a work, such as facts, ideas, or material that is unoriginal or in the public domain. Although the United States Copyright Office registers works, it does not, unlike the Patent Office, conduct a search of the prior art or make any assessment of validity other than to ensure a modicum of creativity. The Copyright Office functions largely as a recording office. Registration today merely records a presumptively valid copyright.

Patent law offers the possibility of a limited period of exclusive rights to encourage research and development aimed at discovering new processes, machines, and compositions of matter, and improvements thereof. Obtaining a patent involves a detailed government examination to assess protectability. To obtain a utility patent, an inventor must submit an application to the Patent and Trademark Office (PTO) meeting five requirements: patentable subject matter, usefulness, novelty, nonobviousness, and adequate disclosure. Although the utility threshold is low, the novelty and nonobviousness standards are more substantial, and the PTO conducts an independent review of the application to ensure that it meets these requirements.

If the PTO grants a patent, the inventor obtains rights that can be substantially broader than those encompassed by a copyright—a fundamental difference between the two systems. Whereas patents protect the claimed invention whether or not the accused device, manufacture, composition of matter, or process was copied by the defendant, copyright law only protects against copying. Therefore, truly independent creation of the copyrighted work does not violate copyright law. Furthermore, others are free to use the unprotected elements of a copyrighted work. They may also make "fair use" of a copyrighted work.

In contrast, a patent grants its holder the exclusive rights to make, use, and sell the innovation, regardless of how another comes by the knowledge. The patent grant is nearly absolute within the boundaries of the patent's claims, barring even those who independently develop the invention from practicing its art.[2] Infringement will be found where the

[2]The America Invents Act, passed in 2011, establishes prior user rights. See 35 U.S.C. § 273. In addition, in the aftermath of the Supreme Court's decision in *eBay Inc. v. MercExchange, L.L.C.,* 547 U.S. 388 (2006), injunctive relief is not longer routinely awarded in patent cases. Courts now apply an equitable balancing test that can result in a court-determined permanent damage award.

accused device, composition, or process embodies all of the elements of a valid patent claim or accomplishes substantially the same function in substantially the same way to achieve the same result. A patent's breadth is counterbalanced by a term that is short relative to the duration of copyright protection. A patent lasts for 20 years from the application filing date—roughly one-fifth the length of copyright protection.

Despite these differences in scope, the rights granted by copyright and patent law are similar in an important respect—they do not vary much across the wide range of respective forms of subject matter. Under copyright law, a motion picture costing tens of millions of dollars to produce is treated in the same manner as a relatively modest graphic image on a shampoo bottle. The same is largely true for patent protection, which affords pharmaceutical discoveries that could cost hundreds of millions of dollars to develop comparable protection to relatively modest advances in computer software, although the patent system has subtly differentiated patent protection across technological fields. Copyright law affords somewhat greater categorical variation, as reflected in the distinctive rules applicable to music compositions, which are subject to compulsory licensing, and sound recordings, which only enjoy a limited public performance right for broadcast transmissions. In general, however, both copyright and patent can be characterized as granting exclusive rights across broad fields of innovative and creative endeavors, although subject to statutory and jurisprudential variation in scope, rights, exceptions and defenses.

# Appendix B

# Commissioned Paper Authors

*The Impact of Digitization on Business Models in Copyright-Driven Industries: A Review of the Economic Issues*

Lisa Cameron and Coleman Bazelon
http://sites.nationalacademies.org/xpedio/groups/pgasite/documents/webpage/pga_063398.pdf

**Lisa Cameron** is a principal at the Brattle Group with over 15 years of experience consulting to attorneys and companies involved in commercial litigation, regulatory proceedings, and other complex matters. Her industry experience includes energy, telecommunications, consumer products, broadcasting, software, health care, transportation, and pharmaceuticals.

Dr. Cameron has broad experience in intellectual property, regulatory policy, antitrust, and finance matters. In addition, she has testified in matters involving competition and investment incentives before the Federal Energy Regulatory Commission and state public utility commissions.

Prior to becoming a consultant, Dr. Cameron was a professor of economics in Carnegie Mellon University's Graduate School of Business, where she taught courses in microeconomic theory, regulation, and antitrust policy. She earned her B.Sc. in Business/Economics from Cornell University and her Ph.D. in Economics from Stanford University.

**Coleman Bazelon** is a principal at the Brattle Group, which provides consulting and expert testimony in economics, finance, and regulation to corporations, law firms, and governments around the world. Dr. Bazelon

is an expert in regulation and strategy in the wireless, wireline, and video sectors. He has consulted and testified on behalf of clients in numerous telecommunications matters, ranging from wireless license auctions, spectrum management, and competition policy, to patent infringement, wireless reselling, and broadband deployment.

Dr. Bazelon frequently advises regulatory and legislative bodies, including the U.S. Federal Communications Commission and the U.S. Congress. He also has expertise in the federal government's use of discount rates for policy and regulatory analysis, intellectual property valuation, and antitrust and damages analysis. Prior to joining Brattle, Dr. Bazelon was a vice president with Analysis Group, an economic and strategy consulting firm. During that time, he expanded the firm's telecommunications practice area. He also served as a principal analyst in the Microeconomic and Financial Studies Division of the Congressional Budget Office (CBO) where he researched reforms of radio spectrum management; estimated the budgetary and private sector impacts of spectrum-related legislative proposals; and advised on auction design and privatization issues for all research at the CBO.

Dr. Bazelon earned his B.A. in Economics from Wesleyan, his M.S. in Agricultural and Resource Economics from the London School of Economics, and his Ph.D. from the University of California at Berkeley.

*Economic Effect of Copyright: The Empirical Evidence So Far*

Christian Handke
http://sites.nationalacademies.org/xpedio/groups/pgasite/documents/webpage/pga_063399.pdf

**Christian Handke** is Assistant Professor (tenured) of Cultural Economics at Erasmus University Rotterdam and Senior Researcher at University of Amsterdam. At Erasmus University, Dr. Handke is program coordinator for the Master in Cultural Economics and Entrepreneurship. At University of Amsterdam, he participates in the research project on Copyright in an Age of Access. His research focuses on cultural economics and the economics of copyright, innovation, and technological change, as well as the record industry.

In 2010, Dr. Handke received his doctorate in economics at Erasmus University Rotterdam with highest distinction. His dissertation was shortlisted for the Boekman Dissertation Prize 2012. He also holds an M.A. with distinction in Science, Technology, and Society from Linköping University (Sweden) and a B.A. in European Studies from the University of North London. Between 2003 and 2007, he was junior lecturer/researcher

at Humboldt University Berlin, Centre for British Studies, where he participated in the research project on Commerce and Culture.

Christian Handke has consulted for a variety of public and private organizations, including Industry Canada, the UK Intellectual Property Office and Fundacion Autor (Spain).

*Online Access and the Scientific Journal Market: An Economist's Perspective*

Mark J. McCabe
http://sites.nationalacademies.org/xpedio/groups/pgasite/documents/webpage/pga_063400.pdf

**Mark J. McCabe** is a research investigator in the School of Information at the University of Michigan, a visiting professor in the Department of Economics at the University of Goettingen in Germany, and a Visiting Scholar at OFCE and SKEMA Business School in Sophia Antipolis, France. Dr. McCabe's research in the field of industrial organization currently focuses on the economics of digital information goods markets (with a particular interest in scientific publishing) and the implications of the online environment for competition policy. His research has appeared in scholarly journals including the *American Economic Review,* the *Rand Journal of Economics,* and *Nature.* As a member of the State Center Panel of Economists, Dr. McCabe has assisted Attorney Generals from different states including California, Connecticut, Illinois, Massachusetts, and New York, on a variety of antitrust investigations. He earned his B.A. from Brown University, his M.S. from MIT and his Ph.D. in Applied Economics from the Sloan School of Management at MIT.

*Copyright-Protected Assets in the National Accounts*

Rachel Soloveichik and David Wasshausen
http://sites.nationalacademies.org/xpedio/groups/pgasite/documents/webpage/pga_063401.pdf

**Rachel Soloveichik** works for the U.S. Department of Commerce's Bureau of Economic Analysis. Dr. Soloveichik earned her B.A. in Math and Statistics, then her M.B.A. and Ph.D. in Economics from the University of Chicago. Her interests include entertainment investment, biological investment, personal remittances by immigrants, and other areas. Dr. Soloveichik's papers have been published in the *Survey of Current Business* and the *American Economic Review Papers and Proceedings*.

**Dave Wasshausen** is chief of the Industry Sector Division within the Bureau of Economic Analysis's (BEA) Industry Economic Accounts directorate. He is responsible for the preparation and publication of many of the industry accounts products, including the forthcoming arts and cultural production satellite account. Previously, Mr. Wasshausen spent over 20 years working in BEA's National Economic Accounts directorate, most recently overseeing BEA's Fixed Assets Accounts, which included net stocks, depreciation, and fixed investment. His areas of interest include input-output analysis, index number theory, price indexes for IT goods and services, productivity analysis, and depreciation profiles. He earned his Bachelors and Masters in Economics from Miami University and American University respectively. Mr. Wasshausen is published in the *American Economic Review* and the National Bureau of Economic Research journal *Measuring Capital in the New Economy*.

# Appendix C

# Committee Members

**William J. Raduchel,** *Chair*, is an independent director, angel investor, and strategic advisor. He is the non-executive Chairman of the Board of Directors of Opera Software ASA and is a director of ePals, Live Intent, MokaFive, and Virident, all private companies. He is also a director of two public companies—Blackboard, Inc. and Silicon Image. Dr. Raduchel is a strategic advisor to Daily Mail and General Trust PLC, a leading U.K. media company, and to Naspers, Ltd. He teaches corporate strategy at the McDonough School of Business, Georgetown University, and is a strategic advisor to Myriad International Holdings, Trion World Network and vMark. After receiving his B.A. in economics from Michigan State University in 1966, and his A.M. (1968) and Ph.D. (1972) degrees in economics at Harvard, he taught economics, econometrics, and public policy at Harvard. He also served as Assistant Dean of Admissions and Financial Aid for Harvard and Radcliffe Colleges. In the late 1980s, he joined Sun Microsystems, Inc. where he served as Chief Information Officer, Chief Financial Officer, Acting Vice President of Human Resources, and Vice President of Corporate Planning and Development. He also managed relationships with the major Japanese partners. After spending 11 years at Sun Microsystems, Dr. Raduchel joined AOL and served as strategic advisor, Executive Vice President, and Chief Technology Officer. In 2001, Infoworld named him CTO of the year. He was recognized separately as CIO of the year and as best CFO in the computer industry. Dr. Raduchel left AOL in 2002. From March 2004 through June 2006, he was CEO and Chairman of the Board of Ruckus Network, a digital entertainment net-

work for students at colleges and universities. Dr. Raduchel is a member of the Conference of Business Economists and the Board on Science, Technology, and Economic Policy of the National Academies. He was also a member of the National Academies' Committee on Internet Navigation and Domain Name Services and the STEP committee which produced *A Patent System for the 21st Century*. He has several issued and pending patents.

**Peter S. Menell,** *Vice Chair*, is Robert L. Bridges Professor of Law at the University of California at Berkeley School of Law. He is one of the U.S. Patent and Trademark Office's inaugural Thomas Alva Edison Visiting Professionals, where he serves as an expert advisor. After graduating from law school, he clerked for the Honorable Jon O. Newman of the U.S. Court of Appeals for the Second Circuit. Dr. Menell joined the law faculty at the University of California at Berkeley in 1990, where his research and teaching have focused on intellectual property and the digital technology and entertainment industries, as well as environmental law, property law, and law and economics. In 1995, he co-founded the Berkeley Center for Law and Technology where he serves as a director. He has written more than 50 articles and numerous books, including *Intellectual Property in the New Technological Age* (with R. Merges and M. Lemley, now in its 6th edition) and *Software and Internet Law* (with M. Lemley, R. Merges, P. Samuelson, and B. Carver, now in its 4th edition). Dr. Menell has co-authored numerous articles on copyright law with David Nimmer and has contributed to Nimmer on Copyright, a leading treatise. He has organized more than 40 intellectual property education programs for the Federal Judicial Center since 1998. Dr. Menell founded and supervises the Annual Review of Law and Technology (now in its 16th year, published by the Berkeley Technology Law Journal). He has advised the U.S. Congress, federal agencies, state attorney generals, and major technology and entertainment companies on a wide range of intellectual property, licensing, and antitrust matters. Dr. Menell earned his S.B. from the Massachusetts Institute of Technology, his M.A. and Ph.D. in economics from Stanford University, and J.D. from Harvard Law School.

**Michael A. Keller** is the Ida M. Green University Librarian, Director of Academic Information Resources, Founder and Publisher of HighWire Press, and Publisher of the Stanford University Press. As University Librarian, he champions deep collecting of traditional library materials (especially of manuscript and archival materials) concurrent with full engagement in emerging information technologies. Uniquely, Mr. Keller's responsibilities at Stanford encompass libraries, cybraries, academic and residential computing, publishing, and publishing services. Long involved in the great debate on serials pricing, especially in the arenas of

science, technology, and medicine, he has served as advisor, consultant, and committee member to the American Association for the Advancement of Science and many other scholarly societies. Based on the successful HighWire model, Mr. Keller is now fostering development of additional information tools and services for the scholarly community. He speaks at about thirty professional, high-technology, and scholarly gatherings around the world every year on topics ranging from librarianship, musicology, information topography, to national and global information policy. Mr. Keller's board service includes Hamilton College, Long Now Foundation, Japan's National Institute for Informatics, the National Library of China, Biblioteca Alexandrina, The Council on Library and Information Resources, SIPX Inc., and Mondobiotech AG. Keller is a guest professor at the Chinese Academy of Sciences, has been Senior Presidential Fellow of the Council on Library and Information Resources, in 2008 was elected a Fellow of the American Association for the Advancement of Science, and in 2010 was elected Fellow of the American Academy of Arts and Sciences. Mr. Keller was educated at Hamilton College (B.A. Biology and Music, 1967), SUNY Buffalo (M.A. Musicology, 1970), and SUNY Geneseo (MLS, 1971). From 1973 to 1981, Mr. Keller served as Music Librarian and Senior Lecturer in Musicology at Cornell University and then in a similar capacity at University of California at Berkeley. While at Berkeley, he also taught musicology at Stanford University and began the complete revision of the definitive Music Research and Reference Materials. Yale called him to the post of Associate University Librarian and Director of Collection Development in 1986.

**Christopher M. Kelly** is a Silicon Valley-based attorney with a long track record of representing innovative companies and helping make the Internet a safer place for children and adults alike. Most recently, Mr. Kelly was a Democratic candidate for Attorney General of California, finishing second in a field of seven in the June 2010 primary election. Previously, as the first Chief Privacy Officer, and Head of Global Public policy for Facebook, he worked with attorneys general in all 50 states to develop safeguards protecting children from sexual predators and represented the company in complex situations involving privacy and intellectual property in the digital age. As a policy advisor for President Clinton's 1992 campaign and then his White House Domestic Policy Council and Department of Education, Mr. Kelly advanced critical domestic programs, including the successful initiative to put 100,000 new community police officers on America's streets and the formation of AmeriCorps, a network of national service programs that engage Americans to improve education, public safety, health, and the environment. In 1997, he returned to California to clerk for federal Judge Barry Moskowitz of the United States District Court in San Diego. He assisted on a range of criminal and civil

cases, including drug smuggling, immigration, and money laundering. In 1998, he returned to his boyhood home in Silicon Valley to practice law. Among other clients, Mr. Kelly represented Netscape in the Microsoft antitrust case and Diamond Multimedia in the groundbreaking suit over the MP3 player that furthered personal use rights over digital content. He received his undergraduate degree from Georgetown University, a master's degree in political theory from Yale University, and his law degree from Harvard University.

**Ruth Okediji** is the William L. Prosser Professor of Law at the University of Minnesota Law School where she teaches contracts, copyright, trademarks, patents, and global aspects of intellectual property law. After visiting at the University of Minnesota in 2001, Dr. Okediji joined the Minnesota faculty in the 2002-2003 academic year. She served on the faculty at the University of Oklahoma College of Law from 1994 to 2002, where she held the Edith Kinney Gaylord Presidential Professorship. She is an internationally renowned expert on international intellectual property with a special emphasis on innovation policy, technology transfer, copyright and new technologies, and on the geo-political relationship between multilateral trade law, innovation, and intellectual property policy. Dr. Okediji's scholarship focuses on the design and implementation of legal rules, institutions, and processes that shape national and international policies on intellectual property rights. She has written, lectured, and published extensively on these topics. She has also worked with numerous international organizations including the United Nations Development Program's (UNDP) flagship project on Innovation, Culture, Biogenetic Resources, and Traditional Knowledge; the United Nations Conference on Trade and Development (UNCTAD)-ICTSD Capacity Building Project on Intellectual Property Rights and Sustainable Development; and as an advisor to various countries on intellectual property policies under the auspices of the Commercial Law Development Program of the U.S. Department of Commerce. Dr. Okediji has earned numerous teaching awards, citations, and has held an appointment in public service. She has chaired the American Association of Law School's Section on Intellectual Property, Section on Law and Computers, and the Nominating Committee. She also is a member of the Executive Board of the Order of the Coif. At the University of Minnesota, Dr. Okediji recently co-chaired the university-wide committee which helped develop the new Regents Copyright Policy. She has held visiting research positions at Harvard Law School and the Max Planck Institute for International and Comparative Patent, Copyright, Trademark, and Unfair Competition Law in Munich, Germany. She is a member of the New York Bar, the Minnesota Bar, and the American Bar Association.

**Marilyn Hall Patel** served as a judge on the United States District Court for the Northern District of California, sitting in San Francisco, since August 1980 when she was nominated by Jimmy Carter to a seat vacated by Lloyd Hudson Burke, until 2012. She is a member of the Bars of New York and California. Judge Patel was the first woman to serve as Chief Judge of the Court and held that position from 1997 to 2004. Prior to joining the federal bench, she served on the bench of the state court of California. During her years on the bench, Judge Patel has presided over many intellectual property cases ranging from patent to copyright and trademark to trade secret cases. Among them was the litigation involving the original peer-to-peer file sharing system, Napster. She has been involved in a number of advanced legal education programs within and outside the United States on litigation, civil practice, securities law, and intellectual property law as well as a number of other subjects. She has participated in programs conducted by Loyola School of Law and California Institute of Technology delving into the intersection of technology and other important issues including human genome research, communication, and globalization. She has also been one of the initiators of judicial education programs in California and federal courts dealing with gender bias and equity, leading to the first gender bias studies and commissions in these courts. Judge Patel received her B.A. degree from Wheaton College in 1959 and her J.D. from Fordham University Law School in 1963.

**Mitch Singer** is Chief Digital Strategy Officer at Sony Pictures Entertainment. In this capacity, Singer collaborates with Sony Pictures' various business units on studio-wide strategies to address the ongoing digital transformation of the entertainment industry— helping to identify digital business opportunities, exploring new products, formats, and services, representing SPE in industry forums, and working to mitigate digital theft. He focuses on emerging and disruptive technologies and evaluates and develops adaptive business models to stay ahead of the technological curve. In addition to developing new consumer usage models, Singer plays a central role in Sony Pictures' worldwide anti-digital theft and digital rights management efforts. Singer has been the lead negotiator for Sony Pictures in content protection technology licensing issues.

Singer represents the studio in numerous standards setting activities. He currently serves as President of DECE, the 75-member, cross-industry consortium behind UltraViolet (http://www.uvvu.com), the effort to create open standards for digital entertainment distribution enabling consumers to acquire and play content across a wide range of services and devices.

Singer sits on the boards of Motion Picture Laboratories, DVD CCA, Entertainment Technology Center USC, the HDBaseT Alliance as well as

the HQME ("High Quality Mobile Experience") Steering Committee. He also was on the Board of Industry Leaders for the Consumer Electronics Association (CEA).

**Christopher Sprigman** joined the University of Virginia's School of Law in 2005. As the Class of 1963 Research Professor in Honor of Graham C. Lilly and Peter W. Low, he teaches intellectual property law, antitrust law, competition policy, and comparative constitutional law. Mr. Sprigman's scholarship focuses on how legal rules affect innovation and the deployment of new technologies. He received his B.A. with honors from the University of Pennsylvania in 1988 then attended the University of Chicago Law School, serving as a Comment Editor of the University of Chicago Law Review and graduating with honors in 1993. Following graduation, Mr. Sprigman clerked for the Honorable Stephen Reinhardt of the U.S. Court of Appeals for the Ninth Circuit, and for Justice Lourens H. W. Ackermann of the Constitutional Court of South Africa. He also taught at the law school of the University of the Witwatersrand, in Johannesburg, South Africa. From 1999 to 2001, Mr. Sprigman served as Appellate Counsel in the Antitrust Division of the U.S. Department of Justice, where he worked on *U.S. v. Microsoft*, among other matters. He then joined the Washington, DC, office of King & Spalding LLP, where he was elected a partner. In 2003, he left law practice to become a Residential Fellow at the Center for Internet & Society at Stanford Law School before joining the University of Virginia faculty, two years later.

**Scott Stern** is the School of Management Distinguished Professor and Chair of the Technological Innovation, Entrepreneurship, and Strategic Management Group at the MIT Sloan School of Management. He is the co-organizer of the National Bureau of Economic Research (NBER) Innovation Policy and the Economy Working Group and a Senior Fellow of the Searle Center on Law, Regulation, and Economic Growth. Dr. Stern is also an associate editor of *Management Science*, the *Journal of Industrial Economics*, the *International Journal of Industrial Organization*, serves on the Board of Management of the International Schumpeter Society, and has served on the editorial boards of the *Antitrust Law Journal* and the *Journal of Business and Economics Statistics*. In 2005, he was awarded the first Ewing Marion Kauffman Prize Medal for Distinguished Research in Entrepreneurship. Dr. Stern explores how innovation—the production and distribution of ideas—differs from more traditional economic goods, and the implications of these differences for business and public policy. His more recent studies examine the drivers of commercialization strategy for technology entrepreneurs, the determinants of R&D productivity, and the role of incentives and organizational design on the process of

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**Molly Shaffer Van Houweling** is Professor of Law at the University of California, Berkeley, where she also serves as one of the Faculty Directors of the Berkeley Center for Law and Technology. She joined the Berkeley Law faculty in 2005 after starting her law teaching career at the University of Michigan. Ms. Van Houweling's teaching and research interests include intellectual property, law and technology, and property doctrine and theory. Before entering academia, Ms. Van Houweling was President of Creative Commons, a nonprofit organization that facilitates sharing of intellectual property. Ms. Van Houweling has also served as Senior Adviser to the President and Board of Directors of ICANN, the entity that oversees the Internet Domain Name System. She has been a research fellow at the Berkman Center for Internet & Society at Harvard Law School and at the Center for Internet and Society at Stanford Law School. Ms. Van Houweling served as a law clerk for Judge Michael Boudin of the U.S. Court of Appeals for the 1st Circuit and Justice David H. Souter of the U.S. Supreme Court. She received her B.A. from the University of Michigan (1994) and her J.D. from Harvard Law School (1998).

**Paul Vidich** is a director of MediaNet Digital (also known as Musicnet) since 2006 and a director of Reverbnation (since 2009). He is Vice Chairman of the Board of Governors, The New School for Social Research, and is a director of Poets & Writers. Mr. Vidich also serves as Member of Strategic Advisory Board at Brightcove, Inc., and is an advisor to various other Internet companies. He has extensive experience with music and media. As Executive Vice President at Warner Music, Mr. Vidich was responsible for global business development and technology strategy, closing the first major record company agreement with Apple iTunes in 2002, which became the template for deals Apple would later conclude with Universal Music, Sony, and EMI. He was also responsible for worldwide music strategies, market research, technology and business development activities, including joint-venture development, acquisitions and initiatives in mobile, e-commerce, electronic music distribution, and new

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## STAFF

**Stephen A. Merrill,** project director, has been Executive Director of the National Academies' Board on Science, Technology, and Economic Policy (STEP) since its formation in 1992. With the sponsorship of numerous federal government agencies, foundations, multinational corporations, and international institutions, the STEP program has become an important discussion forum and authoritative voice on innovation, competitiveness, intellectual property, human resources, statistical, and research and development policies. At the same time Dr. Merrill has directed many STEP projects and publications, including *A Patent System for the 21st Century* (2004), *Innovation Inducement Prizes* (2007), and *Innovation in Global Industries* (2008). For his work on patent reform he was named one of the

50 most influential people worldwide in the intellectual property field by *Managing Intellectual Property* magazine and earned the Academies' 2005 Distinguished Service Award. He has been a member of the World Economic Forum Global Council on the Intellectual Property System. Previously, Dr. Merrill was a Fellow in International Business at the Center for Strategic and International Studies (CSIS), where he specialized in technology trade issues. He served on various congressional staffs including the U.S. Senate Commerce, Science, and Transportation Committee, where he organized the first congressional hearings on international competition in the semiconductor and biotechnology industries. Dr. Merrill holds degrees in political science from Columbia (B.A.), Oxford (M.Phil.), and Yale (M.A. and Ph.D.) Universities. He attended the Kennedy School of Government's Senior Executives Program and was an adjunct professor of international affairs at Georgetown University from 1989 to 1996.

**Aqila Coulthurst** has been Program Coordinator for STEP since the fall of 2011. Prior to joining STEP, she spent over two years in the production and marketing divisions of the National Academies Press (NAP), the arm of the National Academies that publishes over 200 reports annually. Ms. Coulthurst was involved in several initiatives at NAP including: direct marketing and online outreach; facilitating the sale of intellectual property rights to publishers abroad; and general operational support. She was instrumental in developing relationships with agents and publishers in the Asian market resulting in over $40K in intellectual property sales.

Over the years, Ms. Coulthurst has worked in various capacities at Smithsonian Enterprises, the National Community Action Foundation, Kingsley Associates, and the Center for Science, Technology, and Economic Development at SRI International. She has experience conducting impact assessments and program evaluations, as well as recruiting experts to serve on committees in various fields. In addition to her interest in U.S. competitiveness and innovation policies, Ms. Coulthurst is interested in how these policies impact development abroad. She spent several years studying U.S. foreign policy and sustainable development at renowned institutions in DC and while studying abroad in Central America. She has a B.A. in economics and in Spanish, and a certificate in markets and management from Duke University. She also has a Master of Science in Foreign Service from Georgetown University.