



Governing Knowledge Commons

Edited by

BRETT M. FRISCHMANN

MICHAEL J. MADISON

KATHERINE J. STRANDBURG

OXFORD

Governing Knowledge Commons

Edited by

Brett M. Frischmann

Michael J. Madison

Katherine J. Strandburg

OXFORD
UNIVERSITY PRESS

OXFORD

UNIVERSITY PRESS

Oxford University Press is a department of the University of Oxford. It furthers the University's objective of excellence in research, scholarship, and education by publishing worldwide.

Oxford New York

Auckland Cape Town Dar es Salaam Hong Kong Karachi Kuala Lumpur Madrid Melbourne
Mexico City Nairobi New Delhi Shanghai Taipei Toronto

With offices in

Argentina Austria Brazil Chile Czech Republic France Greece Guatemala Hungary
Italy Japan Poland Portugal Singapore South Korea Switzerland Thailand
Turkey Ukraine Vietnam

Oxford is a registered trademark of Oxford University Press in the UK and certain other countries.

Published in the United States of America by
Oxford University Press
198 Madison Avenue, New York, NY 10016

© Brett M. Frischmann 2014

© Michael J. Madison 2014

© Katherine J. Strandburg 2014

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, without the prior permission in writing of Oxford University Press, or as expressly permitted by law, by license, or under terms agreed with the appropriate reproduction rights organization. Inquiries concerning reproduction outside the scope of the above should be sent to the Rights Department, Oxford University Press, at the address above.

You must not circulate this work in any other form
and you must impose this same condition on any acquirer.

Library of Congress Cataloging-in-Publication Data

Governing knowledge commons / edited by Brett M. Frischmann, Michael J. Madison, Katherine J. Strandburg.
pages cm.

Includes bibliographical references and index.

ISBN 978-0-19-997203-6 (hardback : alk. paper)

ISBN 978-0-19-022582-7 (paperback : alk. paper)

I. Information commons. 2. Knowledge management. 3. Information networks. 4. Communities. I. Frischmann, Brett M., editor of compilation. II. Madison, Michael J., 1961- editor of compilation. III. Strandburg, Katherine Jo, 1957- editor of compilation.

ZA3270.G68 2014

001—dc23

2014004258

Note to Readers

This publication is designed to provide accurate and authoritative information in regard to the subject matter covered. It is based upon sources believed to be accurate and reliable and is intended to be current as of the time it was written. It is sold with the understanding that the publisher is not engaged in rendering legal, accounting, or other professional services. If legal advice or other expert assistance is required, the services of a competent professional person should be sought. Also, to confirm that the information has not been affected or changed by recent developments, traditional legal research techniques should be used, including checking primary sources where appropriate.

(Based on the Declaration of Principles jointly adopted by a Committee of the American Bar Association and a Committee of Publishers and Associations.)

**You may order this or any other Oxford University Press publication
by visiting the Oxford University Press website at www.oup.com.**

About the Editors

Brett M. Frischmann is Professor of Law and Director of the Intellectual Property and Information Law Program at Benjamin N. Cardozo School of Law, Yeshiva University. He is the author of *Infrastructure: The Social Value of Shared Resources* (Oxford, 2012), which won the 2013 PROSE Book Award for the best book in law and legal studies. He is co-author of *Cyberlaw: Problems of Policy and Jurisprudence in the Information Age* (4th edition, 2011).

Michael J. Madison is Professor of Law and Faculty Director of the Innovation Practice Institute at the University of Pittsburgh. He teaches and writes about information law, intellectual property law, contracts and commercial law, and property law. He is co-author of *The Law of Intellectual Property* (4th edition, 2013).

Katherine J. Strandburg is Alfred B. Engelberg Professor of Law and a Faculty Director of the Engelberg Center on Innovation Law and Policy at New York University. She studies intellectual property law, especially at its intersections with user and commons-based innovation, and information privacy law. She also regularly authors amicus briefs on these topics.

Introduction

Brett M. Frischmann, Michael J. Madison, and Katherine J. Strandburg*

The economics of the new commons is still in its infancy. It is too soon to be confident about its hypotheses. But it may yet prove a useful way of thinking about problems, such as managing the internet, intellectual property or international pollution, on which policymakers need all the help they can get.¹

This book seeks to contribute to evidence-based policy making about innovation and creative production. Critics rightly complain that anecdote, ideology, wishful thinking, and brute political influence, more than empirical understanding, often drive intellectual property policy making. We are concerned that recent enthusiasm about knowledge commons approaches (which we share) may be open to the same critique. Rather than embracing knowledge commons indiscriminately, policy making should be based on more evidence and deeper understanding of what makes them tick.

We embrace the analogy between the cultural environment and the natural environment (Boyle 2008; Frischmann 2007) in order to explore the proposition that just as natural resources often are governed by commons, rather than being managed as either public or private property, the production and sharing of knowledge often is sustained by commons governance. Scholars of the natural environment have developed successful methods for

* Brett M. Frischmann is Professor of Law and Director of the Intellectual Property and Information Law Program at the Benjamin N. Cardozo School of Law, Yeshiva University, New York, New York, USA. Michael J. Madison is Professor of Law and Faculty Director of the Innovation Practice Institute at the University of Pittsburgh School of Law, Pittsburgh, Pennsylvania, USA. Katherine J. Strandburg is the Alfred B. Engelberg Professor of Law and a Faculty Director of the Engelberg Center for Innovation Law and Policy at the New York University School of Law, New York, New York, USA. Each is also a member of the Affiliated Faculty of the Vincent and Elinor Ostrom Workshop in Political Theory and Policy Analysis.

¹ *Commons Sense*, THE ECONOMIST (July 31, 2008), at 76, <http://www.economist.com/node/11848182>.

studying commons arrangements systematically and in detail. We borrow from them and propose a framework for studying knowledge commons that begins with the Institutional Analysis and Development (IAD) framework developed and used by Elinor Ostrom and others and adapts it to the unique attributes of knowledge and information.

This book describes the framework, in Chapter 1 and then includes case studies, reactions, and comments from a group of interdisciplinary researchers. The purpose of this book is to begin the careful, detailed exploration of how knowledge commons function, the place they occupy in the cultural environment, the specific benefits they offer, the costs and risks they create, and their relationships to other institutional structures. Eleven case studies of knowledge commons are the heart of the book. The case study authors come from many different research traditions. The cases vary across a broad range of cultural and scientific domains and historical and contemporary practice. This volume brings these studies together as an initial demonstration of the value of studying knowledge commons carefully, in a comparative fashion, in order to develop evidence of the details of their purposes and operations. We hope that in time, empirical study of knowledge commons will show that, properly understood, they may be harnessed and even designed for broad public benefit. Our concluding chapter highlights the framework's success in bringing forward commonalities and differences between knowledge commons, while recognizing that producing generalizable understanding will require many more studies.

As law professors, we undertook this project initially out of interest in the functioning of systems of intellectual property rights—patent, copyright, and related bodies of law. Whether we look at the economics of the global knowledge economy or at the potential for collaboration and innovation unleashed by the computer and network revolutions of the last thirty years, the impulse to examine innovation institutions and behaviors is immediate. Wikipedia is a fascinating thing. The questions that it raises include not only “why do people contribute to Wikipedia?” but also “in cultural, economic, and legal terms, how does Wikipedia function today and how will it evolve in the future?” Linux is a widely used and commercially successful example of an open source computer program. Why have it and other open source programs succeeded, institutionally and organizationally? Why have some open source computer programs not thrived? Similarly broad questions can and should be directed to collaborative enterprises in science, technology, the arts, government, and beyond.

Traditionally, when intellectual property law scholarship examined institutions for promoting innovation and creativity, it divided the world into two, default perspectives: innovation systems organized around markets, supported by intellectual property rights directed to exclusivity and ownership, and innovation systems organized around governments, which intervene in markets (or avoid markets) in various ways to sponsor and subsidize innovation. A third approach, commons-based *sharing* of knowledge and information resources to produce innovation and creativity, is increasingly acknowledged and celebrated, as suggested by the article in *The Economist* magazine quoted above. But writing about the commons approach is often conceptual or

political, using the idea of commons as a rhetorical device to oppose the expansion of intellectual property protection (Boyle 2008; Hyde 2010). Empirical study of norm- and custom-based innovation communities often is developed in opposition to (and therefore in reliance on) market-based presumptions of the need for exclusivity, substituting norm-based exclusivity for legal-defined intellectual property (Raustiala & Sprigman 2012).

One of our goals here is to stake out knowledge commons as an independent, affirmative means for producing innovation and creativity and an important domain for research. In our view, commons are neither wholly independent of nor opposed to markets based on exclusive rights (whether formal or informal), nor are they subordinate to them.

As noted, our approach is inspired by the pathbreaking research of the late Elinor Ostrom, who was awarded the Nobel Prize in Economic Sciences in 2009 for her lifetime of research into the functioning of commons governance, especially in the natural resources context. Ostrom was far from the first scholar to examine resource systems and governance using tools of comparative institutional analysis. But her work and that of her collaborators and successors highlighted commons as an object of study in a way that no scholar had done before. Ostrom also approached the topic with an extraordinary humility and disciplinary generosity, recognizing that understanding this complex area could only be achieved through the contributions of researchers from many fields, aligned via shared methods. Her impact was magnified by her emphasis on a shared research framework accessible to and usable by numerous disciplines. We have tried to extend both the spirit and style of Ostrom's work to our own.

Toward the end of Ostrom's career, she and her colleagues recognized the emerging importance of knowledge commons as an area for sustained research and began to apply the IAD framework to them (Ostrom & Hess 2007; Hess 2012). In 2010 we developed a research framework specifically tailored to the properties that distinguish knowledge and information from natural resources (Madison, Frischmann, & Strandburg 2010). That framework, with some elaborations and clarifications, follows this introduction as Chapter 1 of this book.

The balance of the book is organized as follows.

Chapter 1 lays out our research framework in detail, including its origins in Ostrom's work on commons, the background assumptions of scholarship on intellectual property rights and theories, and the template for organizing research inquiries in particular case studies. It explains in more detail what we mean by knowledge commons, why knowledge commons deserve systematic study, and why we were motivated to write this book. Chapter 1 provides a thorough explanation of our proposed framework that we hope will encourage and enable others to use and improve upon it in their own studies of knowledge commons.

Chapters 2 and 3 situate the study of knowledge commons within a broader context. In Chapter 2, Dan Cole relates the knowledge commons project to Elinor Ostrom's work on natural resource commons, illustrating points of continuity and points of distinction.

Cole offers encouragement and caution to scholars seeking to use Ostrom's work as a starting point for studying knowledge commons. He encourages those seeking "conceptual, analytical, and methodological guidance," arguing that Ostrom's work can provide a foundation for "improv[ing] understanding of information and information flows under alternative institutional arrangements," "diagnos[ing] problems in existing institutional arrangements," and even "predict[ing] outcomes under alternative institutional arrangements." He cautions, however, that those looking to Ostrom's work for normative guidance as to the proper structure of intellectual property law are "bound to be disappointed (or dishonest)" for two reasons: First, Ostrom's work teaches that there are "no panaceas." Second, researchers necessarily choose metrics for assessing commons outcomes. Whereas long-run sustainability is a widely accepted goal for natural resource commons, Cole suggests that outcome metrics for knowledge commons are likely to be much more contested.

In Chapter 3, Yochai Benkler provides a conceptual map for understanding the range of different types of commons that are important to society and deserve systematic study. He argues that there are important differences between the institutional arrangements studied by Ostrom and colleagues, in which a "defined set of claimants" share resources in a self-governing arrangement, and public domain or open access commons, which provide "freedom-to-operate under symmetric constraints, available to an open, or undefined, class of users." Benkler reminds us that knowledge commons arrangements are layered on top of and dependent upon substantial resource sets governed either as public domain commons or through private property arrangements.

Chapters 4, 5, and 6 apply the knowledge commons research framework to commons arrangements for scientific research, where tradition and custom teach that formal intellectual property rights are particularly unlikely to play key roles in institutional governance, but where the knowledge commons research framework nonetheless reveals meaningful structure and governance of knowledge sharing. In Chapter 4, Jorge Contreras targets the genomics research collaborative that constituted the Human Genome Project. Geertrui Van Overwalle follows that chapter with a comment that notes the global context of research on genomic commons, illustrating that commons in general have important international and comparative dimensions. In Chapter 5, Katherine Strandburg, Brett Frischmann, and Can Cui delve into a network of medical researchers and patient advocacy groups titled the Rare Diseases Clinical Research Network, and the related Urea Cycle Disorders Consortium. In Chapter 6, Michael Madison describes a citizen science project, called Galaxy Zoo, that pairs professional astronomers with amateurs.

Chapters 7 and 8 involve commons cases situated in the context of information and communications technologies (sometimes abbreviated ICTs). In Chapter 7, Charles Schweik presents the results of a comparative analysis of open source software development communities. In Chapter 8, Mayo Fuster Morell reports a study of online creation communities (OCCs) such as the photosharing site, Flickr, used for sharing creative content supplied by individuals.

Chapters 9, 10, and 11 involve commons cases that highlight the role of commons governance as it intersects with or overlaps with other governance institutions directed to knowledge production. In Chapter 9, Sonali Shah and Cyrus Mody describe entrepreneurship, and particularly entrepreneurship by technology users, using the knowledge commons perspective and borrowing examples from such diverse domains as windsurfing and probe microscopy. In Chapter 10, Peter Meyer reviews the history of the development of the fixed-wing airplane as an industrial invention, and its associated industries, as the product of open innovation communities that operated in the shadow of patent law. In Chapter 11, Laura Murray describes the history of newspapers with specific attention to historical norms that balanced proprietary control and sharing in journalism.

Chapters 12, 13, and 14 push the knowledge commons research framework in directions that illustrate its utility in contexts far from those the term immediately brings to mind. In Chapter 12, S. Tina Piper studies the history collaborative invention communities in the Canadian military. In Chapter 13, David Fagundes delves into the world of roller derby, an amateur sporting community that is governed almost entirely by informal norms. In Chapter 14, Brigham Daniels subjects the U.S. Congress to study as a case of commons governance in its production of legislation.

As the conclusion to this book points out in greater detail, the first and perhaps most important takeaway from this book is borrowed from a line sometimes attributed to Mark Twain. Asked if he believed in infant baptism, Twain allegedly replied, “Believe it? I’ve seen it done!” And so with the study of knowledge commons. An impressive collection of extremely thoughtful scholars has dissected a broad range of cases of commons in ways that usefully illuminate the workings of each case and, even more important, set the stage for continued comparative analysis of their results. The power and future of commons lies not just in the politics and rhetoric of commons but also in empirical understanding of when and how knowledge commons governance works—and when it doesn’t.

We conclude this introduction by pointing out that our collaboration in producing this work, and in collaborating with the other contributors, is itself best described as a knowledge commons. None of this research would be possible without extraordinary sharing of time, expertise, interest, and ideas. The future of this project depends on continuing that collaboration and expanding it. We hope that reading it inspires you to consider giving our framework a try and encourage you to reach out to us with your ideas and insights for follow-on work.

Acknowledgments

The collaboration that underlies this book began in conversations among the editors about cultural commons and knowledge commons in 2006 and 2007. It took root with the publication of Madison, Frischmann, & Strandburg (2010) and with responses to

that article from a group of generous scholars (Ostrom 2010; Merges 2010; Gordon 2010; Solum 2010; Macey 2010; Eggertson 2010). It continued in September 2011 as a number of researchers from around the world gathered at the Engelberg Center for Innovation Law and Policy at New York University School of Law for a workshop titled “Convening Cultural Commons.” Many of the chapters in this volume were shared in early form in that setting. As editors of this volume and participants in an emerging global enterprise for the study of knowledge commons, we are grateful for the openness with which the work has been received so far and look forward to more and continuing discussion of this important topic.

Professor Strandburg acknowledges the generous support of the Filomen D’Agostino and Max E. Greenberg Research Fund.

References

- JAMES BOYLE, *THE PUBLIC DOMAIN: ENCLOSING THE COMMONS OF THE MIND* (Yale University Press 2008)
- Commons Sense*, *THE ECONOMIST* (July 31, 2008), at 76, <http://www.economist.com/node/11848182>.
- Thráinn Eggertsson, *Response: Mapping Social Technologies in the Cultural Commons*, 95 CORNELL L. REV. 711 (2010).
- Brett M. Frischmann, *Cultural Environmentalism and the Wealth of Networks*, 74 U. CHI. L. REV. 1083 (2007).
- Wendy J. Gordon, *Response: Discipline and Nourish: On Constructing Commons*, 95 CORNELL L. REV. 733 (2010).
- Charlotte Hess, *Constructing a New Research Agenda for Cultural Commons*, in *CULTURAL COMMONS: A NEW PERSPECTIVE ON THE PRODUCTION AND EVOLUTION OF CULTURES* 19 (Enrico Bertacchini et al. eds., Edward Elgar Publishing 2012).
- LEWIS HYDE, *COMMON AS AIR: REVOLUTION, ART, AND OWNERSHIP* (Farrar, Straus and Giroux 2010).
- Gregg P. Macey, *Response: Cooperative Institutions in Cultural Commons*, 95 CORNELL L. REV. 757 (2010).
- Michael J. Madison, Brett M. Frischmann, & Katherine J. Strandburg, *Constructing Commons in the Cultural Environment*, 95 CORNELL L. REV. 657 (2010).
- Robert P. Merges, *Response: Individual Creators in the Cultural Commons*, 95 CORNELL L. REV. 793 (2010).
- Elinor Ostrom, *Response: The Institutional Analysis and Development Framework and the Commons*, 95 CORNELL L. REV. 807 (2010).
- Elinor Ostrom & Charlotte Hess, *A Framework for Analyzing the Knowledge Commons*, in *UNDERSTANDING KNOWLEDGE AS A COMMONS: FROM THEORY TO PRACTICE* (Charlotte Hess & Elinor Ostrom eds., MIT Press 2007).
- KAL RAUSTIALA & CHRISTOPHER SPRIGMAN, *THE KNOCKOFF ECONOMY: HOW IMITATION SPARKS INNOVATION* (Oxford University Press 2012).
- Lawrence B. Solum, *Response: Questioning Cultural Commons*, 95 CORNELL L. REV. 817 (2010).

Contents

Introduction ix

1. *Governing Knowledge Commons*/by Brett M. Frischmann, Michael J. Madison, and Katherine J. Strandburg 1
2. *Learning from Lin: Lessons and Cautions from the Natural Commons for the Knowledge Commons*/by Daniel H. Cole 45
3. *Between Spanish Huertas and the Open Road: A Tale of Two Commons?*/by Yochai Benkler 69
4. *Constructing the Genome Commons*/by Jorge L. Contreras 99
- 4B. *Governing Genomic Data: Plea for an "Open Commons"*/by Geertrui Van Overwalle 137
5. *The Rare Diseases Clinical Research Network and the Urea Cycle Disorders Consortium as Nested Knowledge Commons*/by Katherine J. Strandburg, Brett M. Frischmann, and Can Cui 155
6. *Commons at the Intersection of Peer Production, Citizen Science, and Big Data: Galaxy Zoo*/by Michael J. Madison 209
7. *Toward the Comparison of Open Source Commons Institutions*/by Charles M. Schweik 255
8. *Governance of Online Creation Communities for the Building of Digital Commons: Viewed through the Framework of Institutional Analysis and Development*/by Mayo Fuster Morell 281
9. *Creating a Context for Entrepreneurship: Examining How Users' Technological and Organizational Innovations Set the Stage for Entrepreneurial Activity*/by Sonali K. Shah and Cyrus C. M. Mody 313

10. *An Inventive Commons: Shared Sources of the Airplane and Its Industry*/by Peter B. Meyer 341
11. *Exchange Practices among Nineteenth-Century U.S. Newspaper Editors: Cooperation in Competition*/by Laura J. Murray 365
12. *How War Creates Commons: General McNaughton and the National Research Council, 1914–1939*/by S. Tina Piper 391
13. *Labor and/as Love: Exploring the Commons of Roller Derby*/by David Fagundes 417
14. *Legispedia*/by Brigham Daniels 445
15. *Conclusion*/by Brett M. Frischmann, Michael J. Madison, and Katherine J. Strandburg 469

INDEX 485

1 Governing Knowledge Commons

Brett M. Frischmann, Michael J. Madison, and
Katherine J. Strandburg*

I. Introduction

This chapter sets out the knowledge commons framework that forms the foundation for the case study chapters that follow (Madison, Frischmann, & Strandburg 2010a). The framework builds on the Institutional Analysis and Development (IAD) approach pioneered by Elinor Ostrom and her collaborators for studying commons arrangements in the natural environment (Ostrom 1990). By “knowledge commons” we refer broadly to commons arrangements for overcoming various social dilemmas associated with sharing and producing information, innovation, and creative works (Ostrom & Hess 2006).¹ This

* Brett M. Frischmann is Professor of Law and Director of the Intellectual Property and Information Law Program at the Benjamin N. Cardozo School of Law, Yeshiva University, New York, New York, USA. Michael J. Madison is Professor of Law and Faculty Director of the Innovation Practice Institute at the University of Pittsburgh School of Law, Pittsburgh, Pennsylvania, USA. Katherine J. Strandburg is the Alfred B. Engelberg Professor of Law and a Faculty Director of the Engelberg Center for Innovation Law and Policy at the New York University School of Law, New York, New York, USA. Each is also a member of the Affiliated Faculty of the Vincent and Elinor Ostrom Workshop in Political Theory and Policy Analysis.

¹ In the paper on which this chapter is based (Madison, Frischmann, & Strandburg 2010a), we referred to these as *cultural commons*, which we treat as equivalent to knowledge commons, and as *constructed cultural commons*. *Cultural commons* has been used recently by some other commons scholars (Enrico Bertacchini et al. 2012; Hess 2012). Our approach is inclusive of theirs but perhaps broader. The term “constructed” refers to the idea, which we address in more detail below, that the resources in knowledge commons are built by human agency, rather than found somehow in nature.

book includes case studies of a number of knowledge commons arrangements involving the creation and sharing of a diverse array of knowledge resources, such as scientific data, open source software, news resources for journalism, technological innovations, online knowledge resources such as Wikipedia, congressional legislation, and information used by roller derby participants. Some further examples of the types of arrangements we have in mind are patent pools (such as the Manufacturers Aircraft Association), the Associated Press, certain jamband communities, medieval guilds, and modern research universities. These examples are illustrative and far from exhaustive.

The systematic approach to case study design and analysis provided by the knowledge commons framework is intended not only to structure individual case studies in a useful and productive way but also to make it possible eventually to produce generalizable results. By comparing and aggregating case studies performed according to the knowledge commons framework, it should be possible to inventory the structural similarities and differences between commons in different industries, disciplines, and knowledge domains and to shed light on the underlying contextual reasons for the differences. This structured inquiry will provide a basis for developing theories to explain the emergence, form, and stability of the observed variety of knowledge commons and, eventually, for designing models to explicate and inform institutional design. In addition, an improved understanding of knowledge commons is critical for obtaining a more complete perspective on intellectual property (IP) doctrine and its interactions with other legal and social mechanisms for governing creativity and innovation.

WHAT DO WE MEAN BY KNOWLEDGE COMMONS?

“Knowledge commons” is shorthand. It refers to an approach (commons) to governing the management or production of a particular type of resource (knowledge).

Commons refers to a form of community management or governance. It applies to resources, and involves a group or community of people, but commons does not denote the resources, the community, a place, or a thing. Commons is the institutional arrangement of these elements. “The basic characteristic that distinguishes commons from noncommons is institutionalized sharing of resources among members of a community” (Madison, Frischmann, & Strandburg 2010b: 841). Critically, commons governance is used by a wide variety of communities to manage many different types of resources. Commons governance confronts various obstacles to sustainable sharing and cooperation. Some of those obstacles derive from the nature of the resources and others derive from other factors, such as the nature of the community or external influences. Communities can and often do overcome obstacles through constructed as well as emergent commons.

Knowledge refers to a broad set of intellectual and cultural resources. In prior work, we used the term “cultural environment” to invoke the various cultural, intellectual,

scientific, and social resources (and resource systems) that we inherit, use, experience, interact with, change, and pass on to future generations. We used this terminology to convey the broad range of resources we had in mind but have since realized that some readers found it confusing. Here we use the term "knowledge." We emphasize that we cast a wide net and that we group information, science, knowledge, creative works, data, and so on together.

Knowledge commons is thus shorthand for the institutionalized community governance of the sharing and, in some cases, creation, of information, science, knowledge, data, and other types of intellectual and cultural resources.

Some initial illustrations of knowledge commons suggest the variety of institutional arrangements we believe may be usefully studied using the framework described here.

Intellectual property pools. A patent pool is an agreement by two or more patent holders to aggregate and share their patents by cross-licensing (Shapiro 2000). The patents in question typically relate to complementary technologies, where one holder's exercise of patent rights "blocks" a different holder's exercise of related rights. Pooled patents are typically available to all members of the pool and are available to nonmembers on standard licensing terms. A well-known example of an early patent pool in the United States is the Manufacturers Aircraft Association (MAA), which formed in 1917 and encompassed nearly all American aircraft manufacturers. The Wright Company and Curtiss Company held major patents on aircraft technology, but Wright and Curtiss did not hold all relevant patents, and for any given manufacturer, the cost of licensing a single needed patent from a competitor might have made manufacturing an airplane prohibitively expensive. During World War I, the U.S. government needed airplanes at reasonable costs and in a short time. As a result, the government facilitated the implementation of the MAA, a private corporation. The MAA entered into an agreement with airplane manufacturers, through which the manufacturers pooled their patents and their potential claims for exploitation of the patents by rivals and agreed to cross-licensing of the patents to one another on what was, essentially, a royalty-free basis (Dykman 1964; Merges 1996: 1343–46). Largely because of this functioning commons of patented inventions, airplanes were built.

Open source software. The Linux operating system, an alternative to Windows and Mac OS (the Macintosh operating system), was produced and is still maintained by a collaborative of individual programmers, many of whom are volunteers (some are employed in firms, some of which produce and/or support commercial versions of the Linux software). The Linux collaborative is linked loosely by communications technologies, by members' voluntary allegiance to the project, and by the terms of an open source license. Unlike proprietary computer programs, which are distributed to users in object code or executable format only, open source programs such as Linux are made available in source code form so that members of the community may modify their copies and, under the terms of the governing license, publish their modifications for use by others. Members of the

community may also volunteer their modifications for inclusion in the standard Linux code base. Each member of the Linux community may use material in the Linux commons and may contribute material back to the Linux commons. Each individual member of the community contributes code to the accumulated archive of the Linux kernel, which is the core of the operating system. The rules governing the use of open source material and contributions to the open source commons are partly formal and partly informal. Formally, the software is governed by copyright law, and its use is managed by the terms of the General Public License. Informally, the integrity of Linux as an identifiable and stable program depends on a thin hierarchy of informal authority, which extends from Linus Torvalds at the top to the body of individual developers at the bottom. The result is an exemplary version of a successful open source software program: a complete, complex, and successful industrial product that is built and maintained not by a traditional, hierarchical, industrial firm, but by a loose-knit community (Kelty 2008; Schweik & English 2012).

Wikipedia. This free, online encyclopedia is widely read and cited. It resembles an open source software project in many respects. Volunteer authors create and edit Wikipedia entries; anyone with Internet access can read and use the contents of Wikipedia. Wikipedia is not the product of unregulated, potentially chaotic, openness. A governance structure exists among “Wikipedians” that modulates the openness of the project and operates as a kind of law (Hoffman & Mehra 2009). For example, not all additions and edits to Wikipedia are automatically added to the site. Moreover, a Creative Commons Attribution-ShareAlike license, the copyright license that governs the contents of Wikipedia, restricts the use of the contents of the site.² Wikipedia also has a dispute-resolution system that plays an important role in sustaining the commons. The site is open, but with limits.

The Associated Press. For more than a century, the Associated Press (AP) has been the leading American wire service for newspapers (Reporters of the Associated Press 2007). It offers a compelling example of a knowledge commons that is not grounded in formal IP rights. As factual material, the news itself cannot be copyrighted (though there is an important but narrow “hot news misappropriation” tort rule (Gordon 2009: 2421–23)). Local newspapers could not afford to cover all of the stories that their readers wanted to read, yet the ease with which news stories can be appropriated served as a disincentive to invest in reporting—a classic free-rider dilemma. The solution was a not-for-profit cooperative, owned by the participant news organizations, which partnered originally with Western Union (Shmanske 1986). Cooperative members could both upload material that they originated locally to the wire service and download material that other members produced from the wire service. Local papers were able to carry AP reports on national and international news that they otherwise could not have afforded to produce. Without discounting allegations that the AP’s content was biased politically and that it behaved

² See Wikipedia: Licensing update, at http://en.wikipedia.org/wiki/Wikipedia:Licensing_update.

monopolistically, considerations that highlight the need to view commons with a critical eye, the AP itself operated as a structured commons managed by its members.

Jamband fan communities. Musical groups known as jambands “jam,” or improvise heavily, during live performances. Beginning with fans of the best-known jamband, the Grateful Dead, jamband fan communities have long been encouraged by the artists themselves to produce and share their own concert recordings. These recordings initially were shared via physical media and now are shared using online archives (organized via the website and organization etree.org). The bands encourage this sharing, provided that the fans comply with informal rules that are set by the bands and honored and policed by the fan communities themselves (Schultz 2006). For example, as Schultz describes in his detailed case study of the jamband phenomenon, fan communities generally undertake not to interfere with commercial exploitation of the bands’ own concert recordings (Schultz 2006, 675–76). Commons governance of jamband recordings is structured not merely by fan expectations that norms will be honored but also by file sharing and archiving technologies that reinforce the commercial/noncommercial distinction, by intermediary institutions that host jamband archives, and by the bands, which cooperate with and nurture their fan communities (Schultz 2006: 679–80).

At first glance, these examples may appear to be disparate and unrelated. Yet we believe that a systematic, comprehensive, and theoretically informed research framework offers significant potential to produce generalizable insights into these commons phenomena. Comparative institutional investigation of knowledge commons is relevant to our understanding of social ordering and institutional governance generally. It should also produce insights important to intellectual property law. The conventional view of intellectual property is that resource production and consumption are (and ought to be) characterized primarily by entitlements to individual resource units, held individually and allocated via market mechanisms (Merges 1996: 4–7). To the extent that those market mechanisms are inadequate to optimize the welfare of society, or, in other words, in the event of market failure, government intervention may be appropriate. Intellectual property rights traditionally are justified on precisely this basis (Lemley 2005: 1073). Creative works and new inventions are characterized as public goods, whose intangibility prevents their originators from excluding potential users and thus recouping their investments via sales (Lemley 2005: 1050–55). Copyright and patent laws create artificial but legally sanctioned forms of exclusion, restoring a measure of market control to creators and innovators. Where propertization is insufficient, government subsidy is seen as the primary alternative. Communal and collectivist institutions, particularly those that blend informal normative structures with formal governance rules, are generally regarded as exceptional and dependent upon preexisting property entitlements (Rose 2008: 432–28).

The research framework that we describe below offers a method for assessing the validity of this property-focused narrative. We anticipate that study of a large number of cases