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Information Abundance and Knowledge Commons

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1. INTRODUCTION

This chapter describes a fundamental conceptual and empirical challenge to the foundations of intellectual property (IP) law and then describes what to do in response.

The standard accounts of IP law describe systems of legal exclusion intended to prompt the production and distribution of intellectual resources, or information and knowledge,[1] by making those things artificially scarce. The argument here and below frames IP law instead as one of several possible institutional responses to the need to coordinate the use of intellectual resources given their natural abundance, and not necessarily useful or effective responses at that. The chapter therefore aims to shift the analytic framework from law to governance, and from IP law in isolation to IP law as part of commons, or resource management. Examples and illustrations are drawn from several domains of information and knowledge governance.

A more elaborate introduction to the argument can be laid out as follows. The several forms of IP law – patent, copyright, design rights, and so on – are specialized institutional responses to a subset of the many social dilemmas concerning knowledge and information resources. The standard economists' account of that subset, common to each of these legal fields, is a variant of the well-known "tragedy of the commons." Some relevant intangible or immaterial "thing" in some social environment (the "commons," in this account), such as a creative work or a novel invention, will be overused or overconsumed by those with access to that environment, in the absence of legal devices that limit access to it and permit the thing's producer to exclude unwanted users, or charge a fee for use, or both. Non-paying users are characterized pejoratively as "free riders." This dilemma of overconsumption prompts the related dilemma of underproduction. Because information and knowledge resources are naturally abundant – they are, in their intangible forms, public goods – it is said that only exclusion of free riders permits producers to recover their costs of production and a reasonable profit. In the absence of cost recovery, these resources will not be produced in sufficient quantity or quality. IP law solves these dual dilemmas, by creating legal protections for creative works, inventions, designs, and the like. Access and consumption of these resources is restricted, in the discretion of the producer (that is, the IP rights owner). In sum, naturally abundant intellectual resources must be made artificially scarce to ensure their continued production and distribution.[2]

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[1] The chapter uses the phrases "intellectual resources," "information and knowledge," and "information and knowledge resources" interchangeably. Each phrase is intended to include propositional knowledge, technical and scientific knowledge, art and culture, data, and informal, tacit, and customary knowledge.

[2] For present purposes I mostly set aside the important alternative solution to the underproduction dilemma. In the text, IP law is a creature and feature of an exchange-based market. As an alternative, the state may, and often does, provide information resources either directly (via procurement and production of those resources itself) or indirectly (via funding resources, via tax subsidies, and otherwise).

As applied to knowledge and information resources, this standard account is subject to well-known and critical flaws. Most important, because knowledge and information resources are public goods – that is, because they are nonrival and nondepletable – the tragic dilemma of overconsumption is non-existent.[3] Knowledge resources are by definition abundant; consumption or use of the resource by one person does not diminish the pool of that resource that is available to anyone else. A scarce resource can be overconsumed. An abundant one cannot be. IP rights create scarcity in the face of abundance, but in doing so IP systems may produce the very overconsumption problem that IP rights are, in theory, intended to solve. Moreover, in certain respects existing IP law makes this artificial overconsumption problem worse rather than better, by imposing legal standards for protection of copyright works and inventions that are so low, often, that cultural and technical worlds are overrun by an overabundance of IP rights.[4] Law gives society an abundance of artificially scarce resources.

Social dilemmas concerning the production and distribution of information and knowledge resources are important and should not be ignored, and in appropriate settings IP laws turn out to be useful and well-justified responses. But inverting usual suppositions about scarcity and abundance means likewise inverting usual suppositions about the importance of IP law, rights of exclusion, and other conceptual frameworks for managing intangible resources. Social dilemmas concerning production and distribution of intellectual resources may be less significant, often, when compared with social dilemmas concerning coordination and combination of those resources. The experience of user innovation communities[5] and the lessons of recent scholarship on norm-based creative communities[6] teach that intellectual resources may be provided and distributed via robust systems that have little or no basis in formal IP law. Yet coordination and combination of those resources may be extraordinarily challenging, as they often overlap and/or interact with one another as they are consumed and re-used. Few intellectual resources today exist in splendid isolation from other intellectual resources; re-mixing within and across scales, genres, traditions, and histories is the historical norm rather than the 21st century or digital exception.[7]

As necessary solutions to relevant social dilemmas, IP systems may be the exception rather than the rule. Governance systems, in which the production, distribution, conservation, and coordination of abundant resources are managed via blends of law, technical rule, custom, convention, and social norm, are likely the more productive framework for understanding and interpreting those solutions.

That conceptual or theoretical beginning is subject to an all-important proviso. The points outlined above raise empirical questions as well as theoretical provocations. The remainder of this

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[3] For an extended version of this critique, see Brett M. Frischmann, *Infrastructure: The Social Value of Shared Resources* (Oxford University Press, 2012).

[4] For a related view, see Michael A. Heller and Rebecca S. Eisenberg, 'Can Patents Deter Innovation? The Anticommons in Biomedical Research' (1998) 28 *Science* 698.

[5] E.g., Eric von Hippel, *Democratizing Innovation* (MIT Press, 2005).

[6] E.g., Kal Raustiala and Christopher Sprigman, *The Knockoff Economy: How Imitation Sparks Innovation* (Oxford University Press, 2012); Aaron Perzanowski, 'Tattoos and IP Norms' (2013) 98 *Minn. L. Rev.* 511.

[7] This is consistent with Lawrence Lessig's work, even though he frames his argument in terms of Internet exceptionalism. See Lawrence Lessig, *Remix: Making Art and Commerce Thrive in the Hybrid Economy* (Penguin Press, 2008).

chapter is devoted primarily to the empirical aspects of this topic. Perhaps we have IP laws where they are unneeded; perhaps we have IP laws where they are needed but that function in ways other than intended or desired. A way systematically to investigate those questions from an empirical perspective, with due attention to context and nuance, is needed. This chapter outlines such a method.

The chapter takes as its central organizing principle the idea of knowledge commons. The phrase "knowledge commons" captures the idea of governance of intellectual resources, including copyright works and patented inventions and also including public domain material, data, tacit knowledge, and know-how. The term "commons" denotes the proposition that in any particular context or environment, those resources are likely to be governed by some combination of positive law and informal devices.[8] The result may be a regime of more or less strict exclusion; the result is often, instead, a regime of knowledge and information sharing, where the sharing has an identifiable social and cultural structure or discipline. Call this "managed openness." Commons, according to this usage, does not mean "open to all, on unregulated terms," even where the knowledge resource is formally part of a public domain. Commons means structured sharing. Even public domain resources are governed via structures that can be investigated and described.

The point of linking information abundance with knowledge commons is that knowledge commons represents a method of understanding governance of abundant information resources. Sharing strategies, as forms of knowledge commons, may exist as responses to social dilemmas other than the coordination and combination dilemmas highlighted above. This chapter, however, draws attention to those coordination and combination dilemmas precisely because they so clearly illustrate the weaknesses of the standard economic justifications for IP laws.[9] The chapter does not take a strong normative position regarding commons in general. Instead, it offers knowledge commons as an analytic framework for collecting research and data regarding governance in the knowledge and information context. IP laws may play a role in knowledge commons governance. The question to be addressed – rather than simply assumed – is how and when that is the case.

Two limitations guide the presentation in order to sharpen it. First, some examples of commons as solutions to coordination and combination dilemmas are drawn in parallel with scholarship on user-innovation communities. That work describes how end-users of knowledge goods – meaning tangible or material embodiments of knowledge resources – explore and exploit access to those goods, via use and experimentation, and develop new or improved or different applications and forms, all without guidance, commands, or incentives from IP laws or IP rights holders. Such user-innovation communities are particularly robust in in technical domains and in consumer product or consumer technology domains. Second, some examples are drawn with reference to law itself, as an intangible and therefore widely shared intellectual resource;[10] user-

[8] See generally Brett M. Frischmann, Michael J. Madison and Katherine J. Strandburg (eds), *Governing Knowledge Commons* (Oxford University Press, 2014), discussed in the following sections.

[9] Julie Cohen frames this point specifically in terms of copyright law. *See* Julie E. Cohen, 'Copyright as Property in the Post-Industrial Economy: A Research Agenda' (2011) 2011 *Wisc. L. Rev.* 141, 155 ("[C]opyright is valuable not (only) because it is individual and atomistic … but also because it facilitates combination and coordination.").

[10] For provocative accounts of law as a shared information resource subject to coordination dilemmas, see Gillian K. Hadfield, 'Legal Infrastructure and the New Economy' (2012) 8 I/S: *A Journal of Law and Policy*

innovators may develop new models of governance to accompany their modes of innovation.[11] Combining the three perspectives – knowledge commons, user-innovation, and law as a shared intellectual resource – one may ask the following question. Can knowledge commons help us understand the dilemmas of abundance, meaning both governance by law (as in the case of IP systems) and also governance of law? This chapter explores answers.

The next section of this chapter introduces the knowledge commons concept in some additional detail and provides some initial illustrations.

2. KNOWLEDGE COMMONS GOVERNANCE

Following Elinor Ostrom's groundbreaking work on institutions for resource management in the natural resource and environmental contexts,[12] Frischmann, Madison, and Strandburg describe knowledge commons generally as governance solutions for shared resources subject to social dilemmas.[13] In the first place a resource is identified or created; use of that resource is purposefully shared by some population of producers and/or consumers. In the second place there exists a number of possible social dilemmas associated with the shared production and/or use of that resource, deriving generally from interests in social collaboration and cooperation. Commons address one or more of those dilemmas. Commons are forms of governance, or management, of shared resources.

With respect to natural resources, Ostrom and her colleagues and collaborators demonstrated the viability of a range of sustainable, durable commons governance strategies preserving the resource over time, implemented by local groups and communities using well-structured convention and custom. Commons are collectively managed, and they are often marked by the absence of formal, market-based property law systems. In their re-purposing of Ostrom's work, Frischmann, Madison, and Strandburg set out a research framework to investigate the viability of equivalent commons governance strategies with respect to knowledge, scientific, and cultural resources. Knowledge commons governance may differ from natural resource commons governance in key respects, beginning with the fact that knowledge commons resources, unlike forests or fisheries, are naturally nonrival or nondepletable and therefore naturally or inherently shareable. The case for sustainable commons governance is neither inherently stronger nor weaker as a result. Instead, cases of knowledge commons must be researched from the beginning, rather than analyzed solely by analogy to natural resource commons.

Drawing attention to information or knowledge abundance rather than scarcity offers only an introduction to the reframing that this chapter proposes. Nuances matter. First, the challenges

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for the Information Society 1; Gillian K. Hadfield and Barry R. Weingast, 'What is Law? A Coordination Account of the Characteristics of Legal Order' (2012) 4 *J. Legal Analysis* 471.

[11] See Katherine J. Strandburg, 'Legal But Unacceptable: Pallin v. Singer and Physician Patenting Norms', in Rochelle C. Dreyfuss and Jane C. Ginsburg (eds), *Intellectual Property at the Edge: The Contested Contours of IP* (Cambridge University Press, 2014).

[12] Elinor Ostrom, *Understanding Institutional Diversity* (Princeton University Press, 2005); Elinor Ostrom, *Governing the Commons: The Evolution of Institutions for Collective Action* (Cambridge University Press, 1990).

[13] See Frischmann et al., note 8 above.

of abundance have been noted before, in terms of economic theory,[14] in terms of cultural theory,[15] and in terms of social theory.[16] Earlier work suggests that abundance in any specific context may mean "lots," or it may mean "too much"; the distinction may have powerful consequences as that context is fully described in terms of the social dilemmas that are present. Second, abundance in any specific context may be relative rather than absolute. A resource may be abundant with respect to its use by an individual or a single agent or with respect to its use relative to a pair of individuals or agents (one person or a pair may be overwhelmed by information), and in this sense an intellectual resource is an individual resource. Alternatively, a resource may be abundant with respect to its use by a group, community, or population (software developers may be overwhelmed by information), and in this sense an intellectual resource is a social resource. Again, the social dilemmas are described differently in the two cases, and different stable institutional solutions may be present. Third, the fact that intangible intellectual resources are abundant, because of their nondepletable character, should not obscure the fact that knowledge and information often take specific tangible or material forms, which may be independently depletable and therefore scarce. Their scarcity should be understood as a distinct but related phenomenon, complicating the description of relevant social dilemmas and their solutions.[17]

Drawing attention to social dilemmas concerning intellectual resources as coordination and combination problems, and suggesting that the knowledge commons concept may unify research into durable and effective institutional solutions, complements rather than substitutes for long-standing research in game theory and related disciplines on theories of coordination via convention and custom. The best known work in this genre is Schelling's theory of focal points as convention-based solutions to what is sometimes referred to as "the meeting place problem."[18] Focal point theory, and related work on conventions, customs, and social norms, shares with the knowledge commons concept an acceptance of the possibility of multiple stable institutional solutions to a given social dilemma; an acceptance of multiple inputs into those solutions (state-based rules, hierarchies, markets and private ordering, and custom, convention, and social norm); and a special interest in shared or common knowledge as prerequisite for their emergence.[19] The knowledge commons concept is not limited to game theoretic environments, however.

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[14] See Mark A. Lemley, *'IP in a World Without Scarcity'* (2015) 90 *N.Y.U. L. Rev.* 460 (focusing on production and distribution issues in IP law but referring only indirectly to governance of coordination dilemmas).

[15] See Grant McCracken, *Plenitude 2.0 – Culture By Commotion* (rev. ed., Periph.: Fluide, 1998); Grant McCracken, 'The Politics of Plenitude' (1998) *Reason* (August/September), available at http://reason.com/archives/1998/08/01/the-politics-of-plenitude (accessed January 20, 2016).

[16] See Andrew Abbott, 'The Problem of Excess' (2014) 32 *Sociological Theory* 1 (focusing on problems of coordination).

[17] See Michael J. Madison, 'Of Coase and Comics, or, the Comedy of Copyright' (2009) 95 *Va. L. Rev*, In Brief 27.

[18] Thomas C. Schelling, *The Strategy of Conflict* (Harvard University Press, 1960).

[19] On the respective roles of common knowledge and salience in the emergence of conventions and social norms, see David K. Lewis, *Convention: A Philosophical Study* (Harvard University Press, 1969); Edna Ullman-Margalit, *The Emergence of Norms* (Clarendon Press, 1977). The idea of law as a solution to coordination problems has been imported into legal scholarship by a number of scholars. See, e.g., Steven J. Burton, 'Default Principles, Legitimacy, and the Authority of a Contract' (1993) 3 *S. Cal. Interdisc. L.J.* 115; Marcel Kahan and Michael Klausner, 'Standardization and Innovation in Corporate Contracting (Or

3. AN ILLUSTRATION: LAW ITSELF AS KNOWLEDGE COMMONS

Against that background, law itself consists of a potential case of knowledge commons, in the sense that law in a general sense or law in any particular social context consists of a shareable knowledge resource that is potentially subject to social dilemmas. Law illustrates particularly clearly how the prototypical social dilemma for shared knowledge resources may be the problem of coordination and combination.[20] If multiple individuals or small groups could invent and apply their "own" law at will, with no discipline to enforce what is valid, legitimate, and enforceable, then – arguably – society could not function. Society runs the risk of excessive conflict as partisans of different rule-sets interact but in legally incompatible ways. Despite the many criticisms of systems of law-making and law enforcement, it is rare to hear the criticism made that the dominant social dilemma regarding law (or good law, or just law, or efficient law) is that it is systematically overconsumed and underproduced.[21] The problem is typically not too little law, but too much.

Positive law-making by executive and legislative authorities can be understood as a case of solving this social dilemma via centralized, top-down, hierarchical authority. Law is a kind of shareable resource provided by a single producer, with its development, extension, and enforcement coordinated – via disciplinary subdivisions (contract or obligation, property, tort, criminal law, and so on) and via institutional subdivisions (courts, legislatures, and agencies at national and local levels) – partly by the state and partly (in democratic systems) by private actors.

Does knowledge commons as governance offer a stable alternative to what I have just described as government coordination of law?[22] The idea of "law" here has to take on a different meaning; clearly it is at least unorthodox and at worst incoherent to speak of formal, positive law as being collectively managed via convention and custom in local communities. Re-characterizing law as a form of governance, or the shared expectations, customs, conventions, and norms by which members of a community are governed and/or govern themselves, makes the question more tractable.[23] New and stable law in that sense can emerge from and be governed from below (governance of governance, as it were), that is, from user or community practice, or as practice

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"The Economics of Boilerplate")' (1997) 83 *Virginia L. Rev.* 713; Richard H. McAdams, 'A Focal Point Theory of Expressive Law' (2000) 86 *Virginia L. Rev.* 1649.

[20] See Hadfield, note 10 above.

[21] The criticism is made, but it is rare. Even if underproduction of law is a relevant social dilemma, it does not necessarily follow that private rights of exclusion are the appropriate solution. Permitting producers of law to appropriate private returns by granting them rights of exclusion in legal resources often – though not always – conflicts with basic notions of social justice and equality before the law. See *Wheaton v. Peters*, 33 U.S. (8 Pet.) 591 (1834) (rejecting a claim of copyright in the opinions of the Supreme Court of the United States); 17 U.S.C § 105 (2012) (excluding works of the US Government from copyright). Crown copyright in the United Kingdom suggests that this principle has limits, even in democratic countries.

[22] The question has analogues in political theory. See Yochai Benkler, *The Wealth of Networks: How Social Production Transforms Markets and Freedom* (Yale University Press, 2006); James C. Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (Yale University Press, 1998); Fred Turner, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (University of Chicago Press, 2006).

[23] It might be more appropriate to treat formal, positive, bureaucratized law and evolutionary, evolving, community-managed governance as two poles of a spectrum, although it is plausible to view them as occupying a hierarchical relationship as well as an oppositional or complementary one.

combined with formal rules, rather than exclusively from above, from law-making institutions or hierarchies of individuals and firms organized in markets. Commons strategies may emerge to coordinate governance of different sorts, among different communities and/or among different intellectual resources.

Two brief examples illustrate specific knowledge commons solutions to social dilemmas concerning problems of coordination and combination of different sorts, each involving the governance not only of conventional intellectual resources (creative works, patentable inventions) but also governance of forms of governance.[24]

Intellectual property pools. A patent pool is an agreement by two or more patent holders to aggregate and share their patents by cross-licensing.[25] 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 Manufacturer's 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 the 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 United States 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.[26] Largely because of this functioning commons of patented inventions, airplanes were built, and the war was won.

The MAA was not the first patent pool; that distinction likely belongs to the Sewing Machine Combination, constructed in 1856 among the manufacturers of sewing machines and owners of related patents. And it is possible to tell the story of the MAA, and the Sewing Machine Combination, and other patent pools, as stories of successful private ordering grounded in exchanges of the IP rights documented by patents.[27] But telling the story in that way overlooks two key features that align patent pools generally with the knowledge commons concept. First, the

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[24] These examples are drawn from Michael J. Madison, Brett M. Frischmann and Katherine J. Strandburg, 'Constructing Commons in the Cultural Environment' (2010) 95 *Cornell L. Rev.* 657.

[25] See Carl Shapiro, 'Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting', in Adam B. Jaffe et al. (eds), *Innovation Policy and the* Economy, Vol. 1 (MIT Press, 2001).

[26] See *Mfrs. Aircraft Ass'n, Inc. v. United States*, 77 Ct. Cl. 481 (1933); Harry T. Dykman, 'Patent Licensing Within the Manufacturer's Aircraft Association (MAA)' (1964) 46 J. Pat. Off. Soc'y 646; Robert P. Merges, 'Contracting into Liability Rules: Intellectual Property Rights and Collective Rights Organizations' (1996) 84 *Cal. L. Rev.* 1293.

[27] See Adam Mossoff, 'The Rise and Fall of the First American Patent Thicket: the Sewing Machine War of the 1850s' (2011) 53 *Arizona L. Rev.* 165. Carol Rose has argued persuasively that property law and property rights are constructed as stories: e.g., Carol M. Rose, 'Game Stories' (2010) 22 *Yale Journal of Law and the Humanities* 369.

very purpose of a patent pool is knowledge sharing, or structured openness regarding the patented inventions, rather than exclusion, as a solution to problems of an abundance of patents. Second, the knowledge commons solution depends on user (or patentee) creation of a foundational legal infrastructure, the cross-license that implements the commitment to sharing in a way that bridges, or coordinates, three sets of laws and rules: the default, positive patent regime and the numerous patents that are subject to the rules of the pool; the norms and rules of antitrust and competition law, governing lawful behavior by market competitors;[28] and the set of terms, expectations, and practices that governed the pool.

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 volunteer collaborative of individual programmers. 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.[29] The result is 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.

As with a patent pool, the integrity and durability of the Linux project is due not only to its members' shared commitment to building and maintaining the program and to their contributions of time, talent, and code, but also to innovations in the legal form that governs access to the code, use of the code, modification and extension of the code, coordination of different portions of the code with each other, and distribution of the code, all in great detail. The open source software license is itself a widely shared form of user-innovation in law, borrowing much of the terminology and structure of a proprietary software license and its relationship to positive copyright law but turning that license inside out, to ensure that the program is shared rather than kept secure from

[28] Early cases on patent pools and antitrust law shifted from uncritically accepting patent pools as matters of freedom to exploit patent rights: see *E. Bement & Sons v. National Harrow Co.*, 186 U.S. 70 (1902); to subjecting patent pools to antitrust scrutiny: see *Standard Sanitary Manufacturing Co. v. United States*, 226 U.S. 20 (1912).

[29] A pair of recent books thoroughly examines the organizational structure of open source software projects. See Charles M. Schweik and Robert C. English, *Internet Success: A Study of Open-Source Software Commons* (MIT Press, 2012); Christopher M. Kelty, *Two Bits: The Cultural Significance of Free Software* (Duke University Press, 2008).

misappropriation.[30] In this case social dilemmas arise not only with respect to the need to coordinate the technical contributions of many different contributions of code but also the need to coordinate the copyrights associated with each of those contributions. As with the patents contributed to a patent pool, in an open source project there may be dozens or even hundreds of distinct contributions and associated sets of IP rights. In isolation, each contributor possesses a separate copyright and therefore has the presumptive right to block unauthorized reproductions and adaptations of the work governed by that copyright. The open source license serves as a shared legal infrastructure that integrates those abundant legal rights, based on formal copyright law, into a single vehicle that is aligned with the substantive norms and expectations of the community.

In short, commons governance in both contexts emerges from user practice but borrows explicitly and directly from formal, positive law. Open source software development communities are organized around and are coordinated by open source software licenses which, the members of both these communities and their commercial partners generally assume, are enforceable with respect to contract law, copyright law, or both.[31] The software development community usually has a social existence that is distinct from the form and terms of its governing license. The community governs itself according to a set of informal but shared norms. Those norms are codified in part and extended in part in the formal license document. The license therefore has a legal existence that is distinct from the full social context of the software development community. But these two phenomena – the social world of the open source software developer and the legal world of the open source software license – are both necessary to the governance of an open source software project. A particular open source software project is a case of commons, a shared resource subject to coordination and combination dilemmas and governed by collectively-produced "law" with material and immaterial dimensions, and social and legal dimensions: the group, the code, and the license.

The next part generalizes, elaborating the knowledge commons concept for potential application to empirical investigation of particular cases. The central point introduced below is that understanding knowledge commons requires empirical as well as theoretical investigation, and effective empirical inquiry requires a systematic approach. The next section describes knowledge commons as a research framework, therefore, rather than as a model, theory, or prescription.

4. A RESEARCH FRAMEWORK FOR UNDERSTANDING KNOWLEDGE COMMONS GOVERNANCE

The point of any research framework is to permit research and data collection to proceed under a common set of assumptions and questions, even if specific research methods and disciplinary

[30] Any conventional IP license can be understood as a kind of user-innovation with respect to adapting the default rules of IP law to the specific needs of the parties to the license. Open source software licenses are distinctive in the sense of the scale of their application and utility, because they serve effectively as governance not merely for the code and its developers and users but for the open source community as that group identifies itself. See Michael J. Madison, 'Reconstructing the Software License' (2003) 35 *Loy. U. Chi. L.J.* 275.

[31] Enforceability is generally assumed, although there is relatively little law on point. The leading US case is *Jacobsen v. Katzer*, 535 F.3d 1373 (Fed. Cir. 2008).

foundations may vary from researcher to researcher or field to field. The framework is neither theory nor model.; Strong theorizing and modelling may follow the research but only light and tentative theorizing, if any, should precede it.

The framework as described is borrowed from a recent book by Frischmann, Madison, and Strandburg titled *Governing Knowledge Commons.*[32] That book presents the framework and applies it to a set of case studies of institutions defined in part by knowledge sharing practices with respect to one or more knowledge resources. While the framework is designed for application at the institutional level, which are referred to as commons, the intuitions and preliminary investigation that animated its development are applicable more broadly. Knowledge resources come in many forms. Information and knowledge are principally immaterial, intangible resources, but they may be embodied in material forms, in flows of knowledge as well as in forms, and in labor and skill and time as well as in embodied creation.[33] The balance of this section gives a fuller account of the framework; the next section introduces some novel commons problems to illustrate the breadth of its potential application.

The knowledge commons framework builds on a series of related intuitions. Commons governance means knowledge and information management characterized by domains of managed openness and sharing of relevant resources, and the first intuition is that commons governance is in broad use in day-to-day practice in a variety of domains and across a variety of scales. Documenting evidence to justify that intuition is a primary goal of the framework. The second intuition is that such structured openness in the management of both natural and cultural resources is likely to lead to socially beneficial and/or socially productive outcomes. Salient among the class of cases where commons governance is successful and sustainable are contexts where social interest in positive spillovers from bilateral market transactions is high. Commons may sustain the production of spillovers when the market otherwise may not.[34] Testing that intuition by applying the framework to case studies is the second goal of the framework. Note that describing the commons framework in terms of spillovers from bilateral market transactions runs a substantial risk of characterizing an information context in "scarce resource" terms rather than in "abundant resource" terms; care must be taken in applying the framework to understand the nature of the resources in question. The final intuition is that a standard framework for identifying and assessing commons across a variety of domains can support the development of more sophisticated tools for realizing the potential for commons solutions in new institutional settings and for distinguishing commons solutions from other solutions in settings where some other approach, such as an approach grounded in IP law, might be preferred. Applying the knowledge commons research framework is an exercise in analyzing colloquial commons institutions, such as "scientific research" taken in the aggregate, in a nuanced way via comparative institutional analysis.

Examining constructed commons in knowledge and information contexts builds on the Institutional Analysis and Development (IAD) framework pioneered by Ostrom and her colleagues, but it adds some important modifications. The IAD framework has been used principally to structure analysis of solutions to collective action problems in natural resource

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[32] Frischmann et al., note 8 above.

[33] See Michael J. Madison, 'Creativity and Craft', in Shubha Ghosh and Robin Paul Malloy (eds), *Creativity, Law, and Entrepreneurship* (Edward Elgar Publishing, 2011).

[34] See Brett M. Frischmann, Michael J. Madison and Katherine J. Strandburg, 'Governing Knowledge Commons', in Frischmann et al., note 8 above.

contexts (so-called action arenas, or action situations) such as forests, fisheries, and irrigation systems. IAD analysis is premised largely on choice-processing, goal-oriented behavior by self-interested individuals. It looks to explain sustainable collective action that produces measurable, productive results. The insight from applying the IAD framework to a large number of governance institutions and resources is that commons solutions can be as stable and robust as market-oriented solutions to classic "tragedy of the commons" overconsumption dilemmas involving depletable natural resources. Shared governance can lead to sustainable fisheries and forests and to regular supplies of usable water.

The knowledge commons framework differs from the IAD framework in certain key respects. It does not assume the agency of rational, choice-selecting, self-interested individuals, as the IAD framework tends to do. It accepts the role of historical contingency and of both inward- and outward-directed (selfless or other-oriented) agents in the evolution of collective or commons institutions. At the front end of the analysis, it requires understanding the contingency of the underlying resources themselves. Natural resource commons largely take the existence of their resources for granted: fish, trees, water, and the like. Knowledge commons identify resource design and creation as variables to be described and analyzed. As intellectual resources (that is, as forms of knowledge and information), patents, copyrights, and underlying inventions, creations, and data are shaped by a variety of institutional forces rather than by nature. Critically, the knowledge commons framework does not assume that the relevant resources are rival and depletable. The knowledge commons framework generally assumes precisely the contrary: that intangible information and knowledge resources are nonrival, nondepletable public goods. The dilemma to be solved is not primarily a classic "tragic commons" overconsumption problem. Instead, it is more likely (in part) an underproduction problem and (in part) a coordination problem. As noted above, this chapter directs primary attention to coordination dilemmas, but in applying the framework to any particular case, care must be given to describing the authentic character of the social dilemmas present.

Against that background, the knowledge commons framework proposes to undertake comparative institutional analysis by evaluating cases of commons resources via a series of questions, or clusters, to be applied in each instance.[35]

The case study investigation begins with a general description of the history and character of the problem that is being addressed by governance in the specific case or context. This may be an explanation that is internal to the governed institution(s) (problems and explanations may emerge from stories told by participants, either today or historically, or both), or an explanation that is external to the governed institution (such as the public goods account of the rise of IP law).

One should ask whether the relevant resource or case is characterized from the outset by patent rights or other proprietary rights, as in the case of a patent pool, or by a legal regime of formal or informal openness, as in the case of public domain data or information collected in a government archive. A particular regime might involve sharing data and information, or sharing rights in information, or sharing both. The character of the commons solution might involve coordinating holders of different IP interests or holders of different public domain knowledge resources, for example.

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[35] A brief overview and schematic of the framework is available at http://knowledge-commons.net/publications/gkc/research-framework/ (accessed January 20, 2106).

Answering that question sets a baseline against which a commons governance regime has been constructed. Within that regime, one next asks definitional questions. What are the relevant resources, taking into account both intangible and tangible resources and their individual or social character? What are the relationships among these resources, the baseline, and any relevant legal regime (for example, what a scientist considers to be an invention, what patent law considers to be an invention, and the boundaries of the patent itself are three related but distinct things)? What are the boundaries and constitution (membership) of the community or communities that manage access to and use of those resources? How is membership acquired (this may be informal, formal, or a blend of the two), and how is membership governed? What is good behavior within the group, what is bad behavior, who polices that boundary, and how?

Next are questions concerning explicit and implicit goals and objectives of commons governance, if any such goals and objectives exist (it is possible that commons governance regimes emerge from historical contingency rather than via planning). Is there a particular resource development or management dilemma that commons governance is intended to address, and what commons strategies are used to address that dilemma?

How "open" are the knowledge and information resources and the community of participants that create, use, and manage them? *Governing Knowledge Commons* argues that commons governance regimes involve significant measures of resource and community sharing and openness. Their details should be specified, along with their contributions to the effectiveness of commons. Some commons and commons resources have precise and fixed definitions of both resources and community membership. Either resources or membership or both may be more fluid, with boundaries defined by flexible standards rather than by rules.

A large and critical cluster of questions concerns the dynamics of commons governance, or what Ostrom refers to as the "rules-in-use" of commons: the interactions of commons participants and resources. Included in this cluster of questions are: (1) details of stories of the origins, histories, and operations of commons; (2) formal and informal (norm-based) rules and practices regarding distribution and coordination of commons resources among participants, including rules for appropriation and replenishment of commons resources; (3) the institutional setting(s), including the character of the regime's possibly being "nested" in larger scale institutions and being dependent on other, adjacent institutions; (4) relevant legal regimes, including but not limited to IP law; (5) the structure of interactions between commons resources and participants and institutions adjacent to and outside the regime; and (6) dispute resolution and other disciplinary mechanisms by which commons rules, norms, and participants are policed.

At this point it becomes possible to identify and assess outcomes. In Ostrom's IAD framework, outcomes are typically assessed in terms of the resources themselves. Has a fishery been managed in a way that sustains fish stocks over time? Do commons participants, such as the members of a fishing community, earn returns in the commons context that match or exceed returns from participation in an alternative governance context? In knowledge commons, resource-based outcome measures may be difficult to identify and assess. Sustaining the resources and their uses, individually or in combination, may be the point. In a patent pool, pooled resources may constitute components of larger, complex products that could not be produced but for the pooling arrangement that reduces transactions costs among participants. Outcomes take different forms. It may be the case that patterns of participant interaction constitute relevant outcomes as well as relevant inputs. Agency, in a manner of speaking, may be less important than identity; the group

and its participants, in a particular institutional setting, may be ends as well as means. Levels and types of interaction and combination matter. Participant interaction in the context of a shared resource pool or group may give rise to (or preserve, or modify) an industrial field or a technical discipline. In that specific case, such spillovers may be treated as relevant outcomes.

Having identified relevant outcomes, it becomes possible to look back at the problems that defined commons governance in the first place. Has the regime solved those problems, and if not, then what gaps remain? How do the outcomes produced by commons governance differ from outcomes that might have been available if alternative governance had been employed? Has commons governance created costs or risks that should give policy makers and/or institution designers pause? Costs of administration might be needlessly high; costs of participation might be high. A collection of industrial firms that pool related patents in order to produce complex products may engage in anticompetitive, collusive behavior. Commons governance may facilitate innovation; it may also facilitate stagnation.

5. THE KNOWLEDGE COMMONS RESEARCH FRAMEWORK APPLIED

The social worlds of knowledge and innovation are filled with cases of commons, in which users (or consumers, or participants, or others) are responding to social dilemmas and generating or making sets of governance rules and standards for themselves.This chapter lacks the space to fully apply and specify the framework with respect even to one rich case study; instead, it suggests how the knowledge commons framework may inform further research, particularly with respect to the related ideas of user-innovation and law as a shared commons resource.

5.1 Galaxy Zoo[36]

Example one is a case in which commons governance emerged to coordinate an astonishingly and apparently unmanageably large information resource.

Galaxy Zoo supplies a wildly successful model of what popular media refer to at times as "citizen science" and at other times and in other respects as peer production or "crowdsourcing." Academic researchers in astronomy in 2007 created a website that invited any and all comers to undertake the task of classifying approximately 900,000 galaxies, by looking at images downloaded from a recent sky survey. The classification exercise involved only a handful of relatively simple criteria and could be undertaken by non-experts after a brief online tutorial. The sponsoring researchers expected to rely on the results as part of preparing traditional scientific papers. (In the main, that has been the case, with some exceptions.) The researchers' initial modest expectations regarding the number of visitors to the site and the quality of their contributions were rapidly and vastly exceeded. The project was quickly extended both in depth and in breadth. The socio-technical "zoo" architecture that evolved in conjunction with the original Galaxy Zoo project has been refined and applied to additional and similarly-structured scientific research projects, all of them collected since December 2009 under the umbrella name, the "Zooniverse."

Galaxy Zoo began as a single solution to a pair of research problems. One of these was the domain of Kevin Schawinski, who in the mid-2000s was a graduate student in astronomy at the University of Oxford. Schawinski was researching the evolution of elliptical galaxies, that is, he

[36] This subsection is based on Michael J. Madison, 'Commons at the Intersection of Peer Production, Citizen Science, and Big Data: Galaxy Zoo', in Frischmann et al., note 8 above.

was pursuing morphological analysis of galaxies, distinguishing elliptical from spiral-shaped galaxies. Galaxy morphology is closely linked to color. Most spiral galaxies have a distinct blue tinge, which is associated with the younger, hotter stars in their spiral arms. Elliptical galaxies usually appear red, indicating the older ages of their stars and low levels of star formation. Blue ellipticals suggest the existence of gas reservoirs sufficient to support significant levels of star formation and are therefore of special interest to researchers. Schawinski aimed to examine a massive amount of digital astronomical data recently made available by the Sloan Digital Sky Survey (SDSS), a project of an international consortium of seven universities, other participating research institutions, several governments, and the Alfred P. Sloan Foundation. The SDSS had undertaken the largest comprehensive electronic map of the northern sky produced to date. Using a special purpose telescope on Apache Point, New Mexico, beginning in 2000 it imaged 10,000 square degrees of the sky, 70 million stars, and 50 million galaxies, resulting in approximately 15 trillion bytes of data, all of which were made publicly available as images to the research community. Schawinski planned to review and classify approximately 900,000 galaxies disclosed in the SDSS data. He tried, briefly, to do this himself, but he abandoned the effort because it was simply too time-consuming.

The second problem was the domain of another Oxford researcher, a post-doctoral fellow named Chris Lintott. Lintott was trying to understand spiral galaxies, also within the SDSS dataset. Whereas Schawinski was after blue ellipticals, Lintott was after red (that is, mostly dead) spirals. (In each instance, the existence of these galaxies would suggest new research problems having to do with galaxy evolution and the birth and death of stars.) Schawinski's conversations with Lintott yielded the idea that the classification exercise that interested each of them could be out-sourced, in a manner of speaking, to the public. Borrowing insights and some elementary technology from other, recent online scientific "crowdsourcing" efforts, notably Stardust@Home, the first, public, Galaxy Zoo website (http://www.galaxyzoo.org) made the SDSS image data available online beginning in July 2007. The images were accompanied by a brief tutorial describing the classification dimensions that visitors were invited to learn and apply. (The phrase "Galaxy Zoo" evokes the idea of a zoo of galaxies – a somewhat unruly collection of "animals" with distinct appearances.) A handful of simple questions were asked, directed to morphological issues. Based on a brief online tutorial, users were asked: Is this an elliptical galaxy or a spiral galaxy, or something else? If it is a spiral galaxy, which way does it appear to be rotating? Related publicity (principally through the BBC) described the launch of the project and pointed visitors to the website.

The project was a tremendous success almost overnight, in several senses related to knowledge commons governance and the challenges of solving coordination problems. First, the data classification problem that Galaxy Zoo was intended to solve was solved far more quickly and thoroughly than the organizers anticipated. Within 24 hours of launch, the site was receiving 70,000 classifications per hour. More than 50 million classifications were received by the project during its first year, from almost 150,000 people. Galaxy Zoo is now the world's largest database of galaxy shapes. The organizers, principally Lintott and Schawinski, built a technical platform that successfully coordinated the individual (and typically quite small) analytic contributions of thousands of non-expert contributors.

Second, the model of citizen science data analysis that Galaxy Zoo introduced appears to be socially productive at least in the sense that it has been accepted by the community of professional astronomers. The original Galaxy Zoo project has been succeeded by follow-on

astronomical research projects using closely related protocols: Galaxy Zoo 2, which asked participants to classify more finely a subset of 250,000 galaxies from the original SDSS Main Galaxy Sample, using a different and more detailed set of questions; Galaxy Zoo: Hubble, which asked participants to classify a different group of older and more distant galaxies using data derived from images obtained through the Hubble Space Telescope; and now Galaxy Zoo Quench, which offered volunteers the opportunity to both classify and analyze galaxy data. In the case of the original Galaxy Zoo, Galaxy Zoo 2, and Galaxy Zoo: Hubble, the zoo-produced data either has been incorporated into a continuing series of scientific research papers published in scholarly journals or is being prepared for publication. (Galaxy Zoo Quench is still in progress.) More than 30 peer reviewed papers have followed from analysis of the original Galaxy Zoo data.

Third, the large scale data analysis and coordination exercise prompted by the original Galaxy Zoo has had unanticipated spillover benefits. Not only have the analytic contributions of Galaxy Zoo volunteers been coordinated successfully, but the thousands of volunteers have coordinated each other by organizing themselves into a self-governed online forum, creating and sustaining a community that is adjacent to, and in some respects overlaps with, the community of professional astronomers. Through their forum, member "Zooites," that is, amateur Galaxy Zoo participants, have made a number of important discoveries based on the original SDSS data shared via Galaxy Zoo. Those discoveries have themselves been the bases for a number of scholarly papers. All of these Galaxy Zoo projects are now part of the larger cluster of citizen science projects known as the Zooniverse. Nearly 200,000 people are registered users of one or more Zooniverse projects, and more than 800,000 have participated in one way or another. This represents knowledge coordination and knowledge commons governance on an extraordinarily large scale.

5.2 Best Practices Projects

Example two is more law-specific on its surface and more subtle in its illustration of shared governance as a solution to a social dilemma. The Galaxy Zoo commons exists as a self-governed community with virtually no explicit reference to IP law or other positive law. Commons governance may arise more clearly in the shadow of formal, positive law. Research on informal social norms and customary practices in a diverse range of creative communities illustrates in part. French chefs, magicians, fashion designers, tattoo artists, stand-up comedians, graffiti artists, and even online pornographers have originated sets of social norms to govern their respective communities specifically in the absence of, and sometimes in opposition to, relevant IP law.[37]

In these cases of "substitute IP," there is a complex relationship between governance norms that guide production, appropriation, and re-combination of the relevant creative things, on the one hand, and group identity and membership, on the other. In some respects, commons governance serves as a guide to solving social dilemmas with respect to the objects of the group (producing and sharing magic tricks for magicians, or jokes for stand-up comedians) but also as a framework for constituting the group itself. Often, production of the intellectual resource (the recipe for the French chef) is not the subject of a social dilemma. The dilemma lies in coordinating distribution of and access to the resource among members of the group. The group or community is both the

[37] Much of the leading work in this area is collected in Aaron Perzanowski and Kate Darling (eds), *Creativity Without Law: How Communities and Markets Challenge the Assumptions of Intellectual Property* (NYU Press, forthcoming).

source and the product of norm-based governance as an emergent or "user-generated" phenomenon. It is not merely the case that magicians follow a sort of private, customary, and informal code with respect to the secrecy of their tricks. It is also the case that the identity of a magician is defined in part by participation in that code.[38]

In a related but distinct class of cases, the relationship between governance and group appears to be more direct. In these cases it appears more clearly that governance itself is the shared commons resource, rather than creative works or ideas or other forms of knowledge. Members of these groups are coordinating their respective responses to possible threats that they will suffer claims of IP rights infringement by third party rights holders and developing a shared governance norm as a result.

Since 2005 scholars at American University's Washington College of Law and Center for Media and Social Impact (formerly the Center for Social Media) have produced and published a series of Statements of Best Practices in Fair Use for a variety of creative communities. The purpose of each of these Statements is to identify and document a set of expectations and practices within specific communities that would guide their creative practice in avoiding unnecessary entanglement with potential liability for copyright infringement. In the context of US copyright law, the purpose is to provide a "soft" guide to fair use. The Statements are not negotiated with rights holders, and it is not intended that compliance with the guidelines in the Statements should be binding, as contractual obligations would be, should formal copyright disputes ever arise. The guides are predictions, grounded in relevant precedent, that, should a dispute later arise, conduct in conformity with the relevant Statement would also turn out to be persuasive to a judge. Creators are given some significant confidence before the fact that their creative practices are lawful, without clearing those practices with rights holders. There is hope but no promise that a future court would excuse accused infringement if the defendant alleged good faith compliance with one of these Statements.

The production of each of these Statements, intended as guides for non-lawyers, follows a similar path: partnership with entities and organizations that represent members of the relevant community; a lengthy series of interviews and meetings with members of the community to determine the community's own understanding of its interests and practices relative to the uses of copyrighted works; and preparation of documents and related materials that fix that understanding in writing, with appropriate illustrations and guidelines, in the context of background copyright doctrine. The results are then published back to the community and otherwise distributed publicly. To date, the objects and subjects of these Best Practices Statements have included documentary filmmakers, producers of online video, media literacy educators, communication scholars, producers of open courseware, poets, dance archivists, research librarians, journalists, and librarians and archivists working with orphan works. This is an eclectic group of interests, and each project is time-consuming and labor-intensive.[39]

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[38] Jacob Loshin, 'Secrets Revealed: Protecting Magicians' Intellectual Property without Law', in Christine A. Corcos (ed), *Law and Magic* (Carolina Academic Press, 2010).

[39] The Statements are collected at http://www.cmsimpact.org/fair-use/best-practices (accessed January 20, 2016).

These Statements both comprise and reflect user-generated shared governance of a distinct sort. The members of a given community of practice are sharing their respective experiences with one another, not in order to produce new or more complex creative products but instead in order to construct a form of collective discipline that is possible only by virtue of that sharing. The shared social resource is governance relative to IP practice; the IP resources themselves are not necessarily social or shared. The Statements are also collective advocacy of a very concrete if unorthodox character. They seek not only to document existing practices within the group, but to create an aspiration, an ideal to which the members of the group might conform. In that sense, the Statements are commons-based law reform, or a kind of law themselves: rules and standards that not only emanate from and govern the group, but also rules and standards by which the group is willing to be judged by external authorities, in alignment with but distinct from the standards otherwise given by positive IP law. Those other authorities might include courts, as noted above, who might look to compliance with a Statement of Best Practices in determining whether or not an act of accused infringement should be excused as fair use. Those other authorities might include other institutional gatekeepers, such as internet service providers or liability insurance carriers, which might rely on compliance with a Statement of Best Practices by a client, customer, or partner as evidence that doing business with that party would not pose an unnecessary risk.

Although some anecdotal evidence suggests that this shared governance has been successful, in the sense that relevant creative communities have benefited in terms of being able to produce additional creative work,[40] the Statements of Best Practices have not been free from debate. The claim that creative groups are normative, law-giving groups is strengthened by evidence that creative communities are themselves normative in terms of being the *loci* of creative production.[41] It is also strengthened, curiously, by published skepticism of the Best Practices Statements.[42] Relevant content owners have been skeptical of the Statements on the ground that they are unilateral, rather than understandings negotiated bilaterally with copyright owners. Some scholars have expressed concern that the Statements tend to lock in backward-looking, customary practices[43] and crowd out the radical creator who is untethered to community norms. In both instances, critics would prefer that the Statements adopt a specifically descriptive perspective and avoid any connotation of normativity. In both instances, critics appear to prefer that governance be documented via bilateral and/or individual determination and adjudication with respect to

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[40] See Patricia Aufderheide and Peter Jaszi, *Reclaiming Fair Use: How to Put Balance Back in Copyright* (University of Chicago Press, 2011); Pat Aufderheide and Peter Jaszi, 'Fair Use and Best Practices: Surprising Success' (2007) *Intell. Prop. Today* 26.

[41] See Michael J. Madison, 'A Pattern-Oriented Approach to Fair Use' (2004) 45 *Wm. & Mary L. Rev.* 1525.

[42] The *Journal of the Copyright Society of the USA*, the leading professional journal of the American copyright law community, recently devoted an entire issue of the journal to papers assessing the Best Practices "movement." The symposium papers include Peter Jaszi, 'Getting to Best Practices – A Personal Voyage Around Fair Use' (2010) 57 J. *Copyright Soc'y U.S.A.* 315; Michael J. Madison, 'Some Optimism About Fair Use and Copyright Law' (2010) 57 *J. Copyright Soc'y U.S.A.* 351; Jennifer E. Rothman, 'Best Intentions: Reconsidering Best Practices Statements in the Context of Fair Use and Copyright Law' (2010) 57 *J. Copyright Soc'y U.S.A.* 371; Michael C. Donaldson, 'Fair Use: What a Difference a Decade Makes' (2010) 57 *J. Copyright Soc'y U.S.A.* 331; Jay Rosenthal, 'Best Practices' (2010) 57 *J. Copyright Soc'y U.S.A.* 389.

[43] The risk of locking-in normatively unattractive bargains over rights is described in James Gibson, 'Risk Aversion and Rights Accretion in Intellectual Property Law' (2007) 116 *Yale L.J.* 882.

individual intellectual resources, rather than collectively with respect to social intellectual resources. Critics resist the idea that the Statements carry the force of a kind of user-created law; the resistance itself highlights the governance power that the Statements exert. There is, to be sure, a kind of strength in numbers.

The purpose of this brief review of the Best Practices Statements is not to resolve the normative question but to point out in a preliminary way how these forms of governance may be analyzed using the knowledge commons framework, borrowing insights from the user-innovation literature and focusing specifically on law as a shared – and abundant – information resource. Further and more detailed exploration of this and other cases should, in time, produce better and generalizable knowledge about commons governance.

6. CONCLUSION

This chapter has highlighted the distinction between information abundance and information scarcity when considering the law and public policy governing intellectual resources, and it has argued that investigation of the information and knowledge landscape has been overly concerned with the latter, at the expense of the former. The result has been overemphasis of the tragedy of the commons story as a metaphor for social dilemmas regarding information and knowledge, an overemphasis on solving alleged problems of information and knowledge production and distribution, and an over-reliance on systems of IP rights as solutions to social dilemmas involving intellectual resources. Highlighting information and abundance, by contrast, leads to increasing attention to questions of coordination and combination with respect to the use and re-use of intellectual resources. Stories other than the tragedy of the commons may come to prominence; strategies of sharing rather than exclusion may take a prominent place in the policy makers' cupboard of institutional solutions. But the ultimate question is empirical rather than theoretical. How should social worlds make sense of the availability of lots of information, rather than too little?

Answering that question leads to the suggestion that the knowledge commons framework offers an important and useful research tool for investigating the institutional dynamics of specific contexts for sharing knowledge resources. In some cases, formal IP systems are appropriate and important pieces of the governance of knowledge and information. In other cases, formal IP systems are effectively irrelevant. In many cases, the question for research is the respective roles of IP and other governance mechanisms. Research from the field of user-innovation studies, and attention to the shared character of law itself as a knowledge resource, suggest productive ways in which coordination dilemmas can be highlighted and solved using knowledge commons strategies. Applying the knowledge commons framework to a robust set of case studies will, in time, yield better information

Knowledge commons, or structured information sharing, does not operate on a simple uniform or standard principle. Research to date confirms as much.[44] And knowledge commons strategies are no more a panacea for social dilemmas concerning information and knowledge resources than are formal IP systems themselves. Applying the knowledge commons framework

[44] Brett M. Frischmann, Michael J. Madison and Katherine J. Strandburg, *Conclusion*, in Frischmann et al., note 8 above.

to a robust set of case studies will, in time, yield better guidance for designing and deploying effective commons governance in knowledge and innovation settings.