

Governing Knowledge Commons: An Appraisal

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How, where, and why do innovation and creativity occur? What influences the design and development of productive and sustainable knowledge production and preservation institutions? And what lessons, if any, should public policy and law derive from answers to these questions? These are the macro questions that inform empirical research on knowledge commons, including the 15 case studies gathered in *Governing Medical Knowledge Commons* and the 11 case studies published in 2014 in *Governing Knowledge Commons* (GKC).

Knowledge commons governance is one strategy for overcoming social dilemmas regarding the production, stewardship, preservation, distribution of, access to, and consumption and other use and re-use of knowledge and information resources. That strategy may often be as important and powerful as strategies grounded in law and related public policy, including intellectual property law, competition law, communications law, and security and privacy law. For its potential to be realized, “knowledge commons” should be more than a rallying cry for the public domain or a piece of rhetoric deployed in political battles about access to knowledge and information. Empirical investigation, of the sort reported in this book, is a critical prerequisite for sound knowledge commons policy.

The social dilemmas encountered in deploying knowledge commons governance are extremely diverse. Moreover, knowledge commons governance is intertwined, in varied and context-specific ways, with publicly enacted law and other government initiatives. As a result, empirical research must be modest. The world of knowledge commons governance is too diverse, both today and in historical context, to permit

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drawing firm conclusions or generating forceful policy guidance based on the empirical work done so far, both in these books and elsewhere.

Nonetheless, some patterns and themes have begun to emerge. Here, we update and refine the tentative substantive conclusions that we offered in the Conclusion to *GKC*. In most respects those conclusions remain viable in light of the evidence collected here; in some respects, added nuance is important. The recurrence of many themes in this new body of evidence encourages us to believe that the *GKC* framework provides a valid and useful basis for generation and testing of hypotheses that eventually will establish a firm foundation for policymaking.

C.1 RECURRING THEMES

The following are themes that we have identified as particularly important to date, given the research included in *GKC* and in this book. In Section C.1.1 we discuss themes that emerged from the *GKC* case studies and remain salient and important, though sometimes in slightly revised form, in light of the additional cases presented here. We also note specific ways in which these themes appear to play out in the medical context. In Section C.1.2, we discuss two additional themes that have emerged from the studies in this book. The first is a modification of the theme of trusted leadership discussed in *GKC*, while the second identifies the important role that the state often plays in structuring medical knowledge commons. Readers and researchers may and likely will derive their own conclusions and identify additional themes in the case studies in this book and in *GKC*. That is absolutely as it should be.

C.1.1 *Themes Identified in GKC*

C.1.1.1 Knowledge Commons Confront Diverse Obstacles or Social Dilemmas, Many of Which Are Not Well Described by or Reducible to the Simple Free-rider Dilemma

As with the case studies in *GKC*, here, the most obvious “goals and objectives” of commons governance often were to organize the sharing of knowledge resources to facilitate the creation of new knowledge. Sometimes – though not always – such sharing had been stymied, as traditional intellectual property theory would predict, by concerns that competitors would free ride on shared knowledge resources without compensating the contributors. But to stop there would be to miss the forest (or worse, the complex ecosystem) for the trees. Here, as in the earlier studies, closer analysis tended to reveal multiple dilemmas and obstacles that shaped action arenas and created demand for governance institutions. Among these were (attribution is to the authors of chapters in this volume):

- *Dilemmas attributable to the nature of the knowledge or information production problem.*

In most arenas, the production of knowledge and ideas is constrained by the nature of the community's substantive goals. Often, and especially in the medical arena, this is a matter of the "biophysical characteristics," not of the non-rivalrous knowledge resource, but of the question at hand. For example:

- The rare disease research consortia studied here and in GKC face institutional dilemmas stemming from the fact that the diseases they study are so rare that cooperation across a number of geographically scattered sites is necessary to make progress (Strandburg and Bechtold; Strandburg and Frischmann; Strandburg, Frischmann, and Cui (in GKC)).
- Many medical problems are so scientifically complex that studying them requires the participation of specialists from a variety of different backgrounds, who may have different norms and practices (Strandburg and Bechtold, Pedraza-Fariña).
- Some medical conditions manifest themselves in sufficiently various and complex ways that cooperation requires resolving and managing difficult and potentially contentious questions about how and with what granularity a particular disease or treatment should be defined (Frischmann and Strandburg, Saxe and Acri).
- The most promising approach to a given medical issue often requires the aggregation of data produced by many sources and stored in many ways, creating a coordination dilemma about how best to standardize formats and definitions (Lee, Evans, Abbott, Strandburg and Bechtold, Strandburg and Frischmann, Larson and Chon, Mattioli).
- Productive research may require access to particular biological materials or research tools, which are not easily substitutable because of the biophysical characteristics of the medical issue at hand (Torrance, Bubela et al.).
- *Dilemmas arising from the interdependence among different constituencies of the knowledge commons.*

The traditional free-rider story focuses attention on the need for cooperation among competing researchers or physicians, who are presumed to have similar skills and objectives. Medical research and treatment often involve a much wider variety of participants, however. Patients, long viewed as essentially passive recipients of the output of medical innovation, are increasingly understood to be crucial participants in the creation and sharing of medical knowledge, whose perspectives must be taken into account in knowledge commons governance (Evans, Boggio, Strandburg and Bechtold, Strandburg and Frischmann). Indeed, patients,

nonprofessional caregivers, and the public at large are beginning to take new and much more central roles in governing and conducting cooperative medical innovation (Oliveira et al., Flowers, Torrance). Dilemmas arising from differences in perspectives, norms, and goals of critical constituencies thus are endemic in the medical context and often pose crucial governance issues. Besides patients, important constituencies may include the following:

- Researchers or physicians from disparate specialty backgrounds (Pedraza-Fariña, Strandburg and Bechtold).
- Clinicians working in very different treatment contexts (Saxe and Acri).
- Study coordinators, informatics specialists, and administrators (Strandburg and Bechtold, Strandburg and Frischmann).
- Insurance carriers, institutional health care providers, and pharmaceutical companies (Abbott, Bubela et al., Larson and Chon).
- Private and public funders (Larson and Chon, Strandburg and Bechtold, Strandburg and Frischmann, Contreras).
- Third-party custodians of health records, data, and tissue samples (Lee, Boggio, Bubela et al., Strandburg and Bechtold, Strandburg and Frischmann).
- *Dilemmas arising from the need to manage rivalrous resources that are necessary inputs into production and use of the shared knowledge resources.* As noted in GKC, knowledge commons governance often must manage the allocation and deployment of rivalrous inputs, such as attention, time, labor, and funding (Contreras, Pedraza-Fariña, Strandburg and Bechtold, Strandburg and Frischmann, Abbott) and rivalrous outputs, such as attribution/authorship credit and associated status (Evans, Larson and Chon, Mattioli, Bubela et al., Saxe and Acri). Governance mechanisms for rivalrous resources routinely must cope with scarcity. Those who manage access to a shared pool of tissue samples or other biomaterials may also need to anticipate and take account of the risk that samples might be damaged during use or transport or simply degrade over time (Bubela et al., Boggio, Pedraza-Fariña).
- *Dilemmas arising from (or mitigated by) the broader systems within which a knowledge commons is nested or embedded.*

All of the knowledge commons examples studied in this book are facilitated by, constrained by, and simply embedded within a much broader social system of medical research, practice, and regulation. General regulations, such as those from the FDA or HIPAA, provide top-down hierarchical constraints with which most knowledge commons must comply. In studying natural resource commons

governance, Ostrom and her collaborators noted the potential benefits of “nested governance,” in which one (smaller, more limited) governance system is embedded within a hierarchically higher (larger, broader) governance system, as a way of ensuring that community governance of a commons resource is appropriately tailored to the expertise and interests of local constituents. Nesting of this sort plays a role in a few of the cases reported here (Strandburg and Bechtold, Strandburg and Frischmann, Saxe and Acri). In many cases, however, the relationship of a medical knowledge commons with the larger universe of medical institutions is one of overlapping participants and functions, rather than of hierarchy. These overlapping relationships are often both facilitative and generative but can also produce governance dilemmas, in part because of their non-hierarchical nature. (Strandburg and Bechtold, Strandburg and Frischmann, Saxe and Acri, Lee, Larson and Chon, Oliveira et al., Flowers).

C.1.1.2 There Often Were Complex Relationships between Knowledge Commons and the Systems within Which They Operate and/or Are Nested and Embedded

We noted in the Conclusion to GKC that we had not fully anticipated how strongly broader background contexts would influence the shape of commons governance and/or interact with other framework inquiries. In the current collection, researchers’ attention to these background constraints pays important dividends. As already discussed, these contexts often give rise to governance dilemmas, both by providing external constraints much as the biophysical characteristics of the resource do in the natural resource context and because of overlapping membership and functions between knowledge commons and other institutions. But the impact of the background context often went well beyond these effects. Background contexts shaped goals and objectives, participants’ roles and motivations, behavioral norms and social relationships, and other important features in much more dynamic ways. Background context and systems matter significantly to the opportunity to develop commons governance in the first place and to the ability of knowledge commons governance to respond to the complex social dilemmas it confronts. History, whether of general practices in the medical field or of social relationships among knowledge commons participants, also matters. It may be more difficult to establish commons governance if historical patterns push in countervailing directions (Bubela et al., Larson and Chon, Saxe and Acri, Mattioli), while preexisting cooperative relationships or norms may promote the emergence of knowledge commons governance (Strandburg and Bechtold, Torrance, Lee). Indeed, where historical patterns suggest an opportunity for commons governance to take root, those patterns may be useful assets for institutional designers and policymakers.

C.1.1.3 Close Relationships Often Exist between Knowledge Commons and Shared Infrastructure

The theme as we expressed it in GKC was “knowledge commons often depended on shared infrastructure.” It may be more appropriate to say that infrastructure and knowledge commons are often related, because shared infrastructure often appears to be central to the success of the knowledge commons, because it is often appropriate to identify shared infrastructure – whether technical (e.g., computing resources) or social (data schemas, or community culture on which commons governance is constructed) – as a type of knowledge commons resource that often helps resolve a social dilemma or overcome an obstacle to cooperation. Shared infrastructure may be created by the commons community (Torrance, Mattioli) or constructed or funded by the state (Contreras, Strandburg and Bechtold, Strandburg and Frischmann, Abbott) or contributed by a private benefactor or “commons entrepreneur” (Oliveira et al., Flowers, Lee, Larson and Chon, Saxe and Acri). It is important, however, not to simply equate knowledge commons governance with infrastructure. Instead, the theme that emerges from the case studies is that knowledge commons governance and shared infrastructure are often closely aligned, with each tending to enable and reinforce the success of the other.

C.1.1.4 Commons Governance Often Evolved over Time, and Commons Seemed to Play an Especially Important Role in the Early Stages of Some Industries

In GKC, we observed that several cases illustrated the proposition that commons governance may evolve as the number of participants grows or as innovation affects the nature of the shared knowledge or the balance between competition and cooperation within the group. This theme appears with less frequency in the current collection of cases in the medical research domain, perhaps because none of the cases in the present book deals with a knowledge commons with a sufficiently long historical track record. While there are examples of knowledge commons governance emerging in relatively nascent medical arenas (Torrance, Pedraza-Fariña, Larson and Chon, Saxe and Acri, Strandburg and Bechtold), we do not yet know whether these arrangements will change as these arenas evolve. There is no instance here of a knowledge commons evolving or maturing into something else.

C.1.1.5 Knowledge Commons Governance Often Did Not Depend on One Strong Type or Source of Individual or Institutional Incentives or Motivations or Cooperation

As we noted in GKC, knowledge commons entail cooperation in the building, sharing, and preservation of knowledge resources, but the reasons individuals cooperated in particular knowledge commons varied. Not only did different individuals

cooperate for different reasons, but sometimes a single individual had multiple motivations for cooperating, partly intrinsic and partly social. Participants often had both competitive and cooperative motives, and the balance between the two often varied among individuals or changed over time. Motivations often varied according to participants' roles as creators, maintainers, and/or users of shared knowledge resources. Yet the overall contrast to the traditional free-rider story, in which individuals are assumed to compete for resources as a result of self-interest, is striking. This variety of motives is partially responsible for the variety of social dilemmas that arise in governing knowledge commons.

This theme, like the earlier ones, carries over from GKC, but limiting the present collection of cases to medical and life sciences research leads inevitably to narrowing the scope of the diversity of motivations. Improved scientific and medical knowledge, improved clinical outcomes, and improved public health outcomes are, in general terms, motivations common to each of the case studies here. Pursuing those goals is complicated by motivations to protect patient interests of other sorts, such as patient anonymity and privacy, and motivations linked to professional and personal advancement, such as attribution and authorship credit for research results. The variety of institutional actors involved in medical innovation introduces further diversity of motivations and incentives, since many of these cases involved participants from public (i.e., the state), not-for-profit (some clinical care institutions and knowledge repositories), and for-profit (some electronic health information providers, some clinical care institutions, many individual clinical providers) institutions.

C.1.2 New and Modified Themes

C.1.2.1 While Informal Governance Institutions, and Especially Trusted Leadership, Sometimes Played Key Roles in Knowledge Commons Governance, Other Modalities for Stabilizing Commons Governance, including Preexisting Cultural or Community Norms, Formal Governance, and the Creation of Infrastructure to Facilitate and Structure Relationships by Commons Entrepreneurs

The commons cases studies in GKC appeared to point to the idea that informal governance, premised on trusted leadership, often plays a critical role in knowledge commons. Based on the data collected in this book, that theme may need to be revised. While trusted leadership as an informal governance mechanism emerged as a central theme in some of the case studies in this book (Pedraza-Fariña, Strandburg and Bechtold, Strandburg and Frischmann, Larson and Chon), the importance of leadership was muted or absent in others. In some cases, the need for strong leadership appears to have been mitigated by the way in which commons governance can usefully inherit and build upon preexisting cultural or community norms (Lee, Evans, Torrance, Flowers). Trust relationships and norms about sharing and cooperation are parts of community or group

fabrics, and those preexisting cultural fabrics are often extremely helpful in the evolution of governance institutions. While strong leadership may be one effective way of promoting the trust relationships that can stabilize knowledge commons governance, preexisting group dynamics play a similarly stabilizing role. In other cases, formal governance appeared to play a far more important role than we had observed in the previous set of cases (Contreras, Abbott, Mattioli, Bubela). In still others, knowledge commons sharing was promoted not so much by trusted leadership as by what one might call “commons entrepreneurship,” in which promoters of a commons-based approach facilitated knowledge commons formation (and set up at least some of the rules of commons governance) by providing infrastructure to reduce the obstacles to knowledge sharing (Saxe and Acri, Contreras, Oliveira et al.). Of course, many knowledge commons arrangements combine one or more of these modalities. Moreover, trusted leadership or commons entrepreneurship may be important in establishing the community norms and relationships that later appear to stand on their own (Evans, Lee, Torrance). Future work may provide insights into the circumstances under which a particular modality can successfully sustain knowledge commons governance.

C.1.2.2 Knowledge Commons May Be Intertwined with State-Supplied Resources in Complex Ways

Whether or not Ostrom intended researchers to infer that the state plays or should play a relatively nominal role in commons governance, that conclusion often has been implicit in commons research in the natural resources domain. In GKC, while we included case studies in which the state played an important role, the state’s direct role in many of the examples studied was minimal. In this book, however, we observe that the state often plays a critical role, or more than one critical role, in developing and sustaining knowledge commons governance in the medical arena. This theme is most directly and forcefully recognized in Contreras (Chapter 2), but the many ways in which the state regulates, supports, and otherwise influences the domain of life sciences and medical research are illustrated in a number of the other chapters (Lee, Evans, Boggio, Abbott, Mattioli, Bubela, Pedraza-Fariña, Strandburg and Bechtold, Strandburg and Frischmann). While a positive role for the state is illustrated in these studies, some of the cases in this book raise interesting questions about the potentially negative impact of top-down rules and regulations in this arena. Flowers explores a knowledge commons devoted to what he terms “outlaw innovation” by patients for whom the pace of mainstream medical research seems unduly constrained by regulation. Though not dealing with the role of the state per se, Saxe and Acri discuss the way in which overly risk-averse understandings of the requirements of evidence-based medicine can stymie the adjustment of

treatment methods to better fit particular contexts. Evans discusses the weaknesses of a top-down approach to aggregating genomic data, proposing that groups of individuals join together to create their own data pools, to be deployed as they see fit. These studies echo the traditional argument by commons proponents against overly uniform approaches and in favor of local control.

C.2 LOOKING AHEAD

We closed *Governing Knowledge Commons* by noting that the book was both a tribute to Elinor Ostrom's landmark book *Governing the Commons* (1990) and the beginning of a new research program and journey, inspired by Ostrom's work but with hypotheses and hopes of its own. We are encouraged that in the space of roughly a decade, the ideas that animate knowledge commons research have moved from being an intuition that there is more to knowledge production than patent and copyright law to being the subject of a research program with participants and adherents around the world. The researchers included in this book are part of an emerging knowledge commons of research and researchers sharing their results. We believe that this additional collection of case studies, supplementing the group presented in GKC, affirms the utility of the research framework described in Chapter 1, as both a design for investigating a knowledge commons case and a device for interpreting and beginning to synthesize data from multiple cases.

As additional theoretical and empirical work on social dilemmas involving knowledge and information resource expands, and as that research is shared and interpreted, its normative implications, and its role in public policy and law, will take on more importance. Throughout this book and its predecessor, we have tried as rigorously as possible to explore knowledge commons governance with an eye to its weaknesses as well as its strengths and to maintain our roles as researchers rather than becoming advocates. What becomes of knowledge commons research in the future, however, will depend critically on how, when, and where it is engaged by legal institutions and public policy in general. That is so for at least two critical reasons: (1) because the character of the knowledge and information resources that are governed as commons (or otherwise) is specified in the first place by those very same legal and public policy institutions and (2) because as the work in this book shows, the state is often a crucial actor in successful commons institutions.

We look forward to continuing along the research pathway identified and illustrated by the work here, and we also look forward eventually to engaging with existing and new colleagues – students, faculty researchers, public policy analysts, participants in legal institutions, and activists and practitioners around the world – to determine whether, when, how, and why knowledge commons may become a better acknowledged and accepted part of the ecology of knowledge and information.