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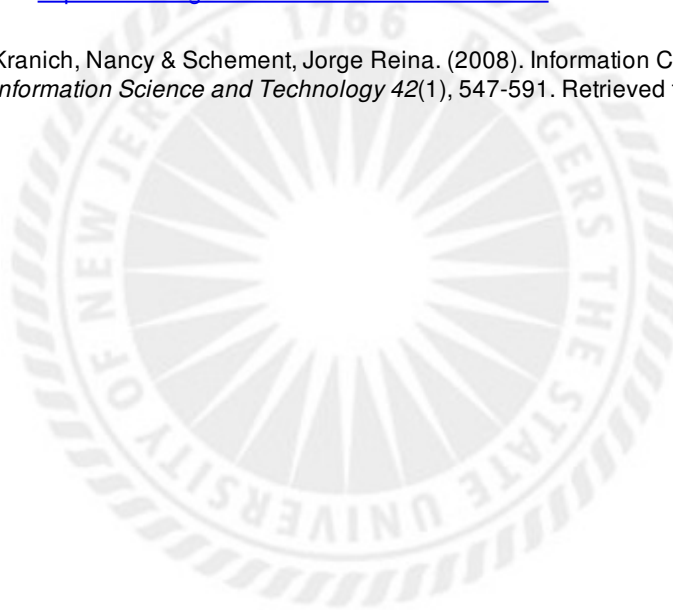
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Information Commons

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ABSTRACT

This chapter reviews the history and theory of information commons along with the various conceptual approaches used to describe and understand them. It also discusses governance, financing, and participation in these commons. Today's digital technologies offer unprecedented possibilities for human creativity, global communication, innovation, and access to information. Yet these same technologies also provide new opportunities to control—or enclose—intellectual products, thereby threatening to erode political

discourse, scientific inquiry, free speech, and the creativity needed for a healthy democracy. Advocates for an open information society face an uphill battle to influence outcomes in the policy arena; yet they are developing *information commons* that advance innovation, stimulate creativity, and promote the sharing of information resources.

Designers of these new information resources can learn from those who have studied other commons like forests and fisheries. Multidisciplinary research needs to go beyond rejecting enclosure to assessing whether alternatives are viable. This requires applying a framework for analysis to determine whether information commons are sustainable as a fundamental information structure for the 21st century.

In this chapter, we conceptualize a phenomenon, a social construction that has become known as the information commons. In a sense, it poses a paradox because while the digital technologies at its core offer vast opportunities for creativity and communication, these same technologies provide opportunities to erode political discourse, scientific inquiry, and free speech; to bar access to intellectual products; to enclose democracy. Our focus is the employment of these technologies for the purpose of organizing information in order for it to be shared by a community of producers or consumers. Generalists and specialists use the term information commons loosely, as both metaphor and actual fact, singular and plural, a usage pattern to which we conform. We frame this chapter around the problem of the information commons as an idea with attributes of community, governance, rights, access, openness, patterns of participation, efficiency, equity, distribution, infrastructure, and conflict management. It is our contention that information commons promise a fresh paradigm for advancing innovation, stimulating creativity, and promoting resource sharing. Not only do they offer

a response to the challenges posed by enclosure, but they also offer an opportunity to build a fundamental institution for a 21st century democracy.

COMMONS IN THEORY

Americans jointly own, share, and administer a wide range of common assets, including natural resources, public lands, schools, libraries, and scientific knowledge. Yet, supporters often encounter hostility when seeking public funding to sustain these essential resources, especially at a time when the marketplace dominates political priorities, even though neglecting them impoverishes culture and endangers democracy. For this reason, “most democracies use a combination of market and nonmarket devices” such as government publications, public libraries, and public broadcasting to assure that citizens get the information they need (Baker, 2002, p. 73).

Historically, the “commons” meant those agricultural fields in England to which certain farmers, called *commoners*, held rights and responsibilities, such as the planting of crops or the grazing of animals. Between 1500 and 1800, however, many of those common fields were converted into private property in order to boost agricultural production, redistribute population, advance industrial development, and ultimately bring lands under the control of wealthy aristocrats. Enclosure occurred both piecemeal and by general legislative action, for no single decision nor act caused the enclosure of public fields—a story similar to today’s enclosure of the commons of the mind. In the end, this “enclosure” movement transformed a traditional, communal method of agriculture into a system in which ownership of property alone determined use rights (Yelling 1977; Turner, 1984).

Yet, if the enclosure movement eclipsed the commons, it also launched a debate over rights of access. Lawyers and economists have traditionally considered ownership either within the realm of a marketplace for the exchange of private property or a market failure requiring government management. Resources such as common property have fallen between this private-public ownership dichotomy (Hess & Ostrom, 2003). The 1861 publication of *Ancient Law* by Henry Sumner Maine (1986) fueled this debate about whether landed proprietors have a special role needing legal protection, and about the legitimacy of enclosing communally owned properties. In the mid-1950s, H. Scott Gordon (1954) and Anthony Scott (1955) kicked off their own debate about the commons by introducing an economic analysis of fisheries in two articles that outlined a theory of the commons. Then, Garrett Hardin wrote his now-famous 1968 article, “The Tragedy of the Commons,” which used the example of overgrazing to argue that unlimited access to resources results in excessive demand and, consequently, in overexploitation. His thesis quickly gained acceptance among those proposing personal self-interest as the sole motivator behind the exploitation of shared resources. Unwilling to concede Hardin’s argument, scholars from several disciplines countered with studies of common property resources, where group control over the resource need not lead to overuse, but rather to the balancing of benefits and costs (National Research Council, 1986; Ostrom, 1990; Ostrom, 2002; Ostrom, Gardner & Walker, 1994; Bromley, 1992; Heriter, 2002; Buck, 1998).

Prominent among these counter theorists is Carol M. Rose (1994, p. 141) who proposes a reverse of the tragedy of the commons; where, for certain types of activities, individuals may choose to “underinvest,” rather than to over-exploit. At a festival or on a

dance floor, for example, the more who take part, the greater the benefit to each participant. “Activities of this sort may have value precisely because they reinforce the solidarity and fellow feeling of the community as a whole; thus, the more members of the community who participate, even only as observers, the better for all.” Rose refers to this type of behavior as the “comedy of the commons,” with the connotation of a happy ending because indefinite numbers and expandability of participation enhance rather than diminish value. She elaborates on this idea using the phrase “the more the merrier” and analogizing to economies of scale, where the larger the investment, the higher the rate of return. Rose contends that people need encouragement to join such nonexclusive activities, where their participation produces beneficial “externalities” for others.

Scholars such as Siegfried Ciriacy-Wantrup and Richard Bishop (1975) distinguished between two types of legal regimes that govern commons: *open-access* (or “no property”) *regimes* and *common property regimes*. With open access regimes, nobody has the legal right to exclude anyone else from using the resource, thus the tragedy of the commons may ensue because of overuse or destruction. By contrast, common property regimes, which regulate the use of “common pool resources,” provide members of a clearly defined group with a bundle of legal rights, including the right to exclude nonmembers from using the resource; thereby, promoting the comedy of the commons. Such common-pool resources also resemble what economists call public goods, such as parks, public transportation, police and fire protection, and national defense. Their challenge stems from the difficulties involved when common pool resources management is based on intensity of use and delineation of eligible users; for

neither common pool resources nor public goods can easily exclude beneficiaries (Stevenson, 1991).

Others have explored the emergence, efficiency, and stability of common property regimes. Carl Dahlman (1980, p. 6), Elinor Ostrom and Vincent Ostrom (1997, pps. 7, 9-14), and Glenn G. Stevenson (1991, p. 47) contest the conventional view in economics that communal ownership and collective control are necessarily inefficient. They maintain that, under certain conditions, economic theory predicts that, such arrangements are superior to private ownership and individual control. Furthermore, Stevenson (1991, pps. 54-57) has identified seven useful characteristics that distinguish common goods from public and private goods: (1) well defined boundaries; (2) well-delineated group of users; (3) multiple users of the resource; (4) well-understood rules; (5) shared rights to use the resource; (6) competition for the resource; and, (7) well-delineated group of rights holders. His examples include communal forests in Europe that are group-managed for a limited, well-defined community, as well as grazing lands available to residents of a particular village during certain pre-determined dates for a limited number of animals.

A leader in the field, Elinor Ostrom has studied the actual workings of common property resources, and observed that common property regimes regulating these resources are distinguished by group, rather than individual control (Ostrom, 1990; 2002); the group is then responsible for balancing benefits and costs, defining who may participate in resource use and to what degree, as well as designating who will make management decisions. With her colleague Edella Schlager, Ostrom underscores that it is “the difference between exercising a right and participating in the definition of future

rights to be exercised ... [that] makes collective-choice rights so powerful” (Schlager & Ostrom, 1992, p. 250-251).

Further challenging the presumption that all common-pool resources are open access, Ostrom analyzed the exploitation of these resources when they are regulated under common property regimes. Through her work with the National Research Council in the mid-1980s, she outlined the components of governance necessary to sustain common property resources efficiently, focusing initially on natural resources in developing countries (National Research Council, 1986; Ostrom 1986). Ostrom’s seminal work, *Governing the Commons* (1990), provides a systematic blueprint for understanding the economic and experimental foundations for common property regimes. By studying a variety of common-pool resources, she derives a framework for assessing commons, plus eight design principles that enable people to use these resources over a long period of time. Included in the framework are conditions necessary for self-governance: clearly defined boundaries, the design and enforcement of rules, reciprocity (the equal exchange of goods and knowledge), building trust and social capital, and communication channels (Ostrom, Gardner & Walker, 1994; Ostrom & Ostrom, 1997; Dietz, Ostrom & Stern, 2003, Petty, 2003). Thanks to Ostrom and her colleagues, groups interested in developing and managing common property now have a theory of commons, and a useful framework to implement them. Ostrom went on to co-found the International Association for the Study of Common Property (IASCP), which focuses on new topics such as genetic resources, roads, the atmosphere, biodiversity, patents, and the Internet.

INFORMATION COMMONS IN HISTORY

The emergence of the Internet and the World Wide Web stimulated a growing awareness among scholars of the value of information, and intensified the study of information as a common property or shared resource. Yet, while the digital age elevated the notion of information commons for the purpose of scholarly research, the roots of information as a shared resource date back to pre-literate societies; where, from earliest times, people relied on shared stories and songs to pass on their stock of commonly held knowledge. Oral stories, sometimes the purview of bards, belonged to everyone and no one; hence, even today, where lore prevails, the imposition of ownership elicits resistance (Ong, 1982; Goody, 1987). With the advent of writing comes the great revolution, people began to fix ideas in texts that gave them portability through space and time. They recorded commercial transactions, religious beliefs, literature, history, and poetry. Hellenistic Greeks collected these texts in great libraries, as in Alexandria, Egypt. Medieval Europeans collected manuscripts in monasteries and manors, and treated them as sacred objects. Not until the mid-fifteenth century invention of the printing press, and the subsequent emergence of capitalism in Europe did texts become things—the first commodities to be bought and sold by means of an information market (Schement & Curtis, 1995, p. 6). From the time of the Enlightenment, English speakers began to think of information as though it were a thing, and acted accordingly—by passing laws to enclose information to prevent theft and by constructing systems to deposit or retrieve information.

Three centuries later, the architects of American democracy maintained that a free society must ensure accessible knowledge for all its citizens. Benjamin Franklin, a printer, established the first lending library in America in 1731, well before he helped

found the republic; and, at the time, his idea of sharing information resources was a radical one--for, in the rest of the world, libraries were the property of the ruling classes and religious institutions (Zimmerman, 2003). James Madison famously declared that “a popular government without popular information, or means of acquiring it, is but a Prologue to a Farce or a Tragedy, or perhaps both. Knowledge will forever govern ignorance, and a people who mean to be their own Governors must arm themselves with the power which knowledge gives” (Madison, 1865, p. 276). In Madison’s great opus, the U.S. Constitution, two provisions address the need for information that is so crucial to democracy. The Copyright Clause does so both by giving authors “the exclusive right” to profit by their writings “for limited times,” and by providing that after the limited term of copyright expires, works enter the public domain, where they are freely available to all (U.S. Constitution, 1789). The First Amendment prohibits government from abridging “the freedom of speech, or of the press, or the right of the people peaceably to assemble.”

Franklin and Madison’s new society soon became an industrial society, where pioneering information systems and technologies, first developed as management tools, became critical to controlling the increasingly complex processes of industrial production. Firms, such as those observed by economist Ronald Coase in the early 20th century, integrated vertically in order to respond to complex and expensive problems of transaction costs (Coase, 1937). The telegraph and telephone improved the country’s capacity to distribute information instantly across long distances, and unlike commodities whose worth increases with scarcity, these emerging communication networks benefited from “network externalities”--that is, they increased in value as the number of participants grew (Schement & Curtis, 1995; Beniger, 1986a; Beniger, 1986b; Schement,

1988). At the same time, social innovations such as widespread literacy and universal access to public schools and libraries established a popular demand for and interest in information. By the second half of the 19th century, the cumulative value of these externalities led to a dramatic increase in patents and copyrights, thus fueling new technologies as well as demand for information.

In the 20th century, Americans led the way toward articulating a vocabulary speaking of information as though it were a tangible thing to be inserted as a raw material in essential resources. As a result, economic innovations (e.g. new markets for information), and social perspectives derived from this attitude (e.g. judging a newspaper by the "amount" of information contained), became so common that they now constitute the texture of society (Schement & Curtis, 1997). Not surprisingly, the U.S. government also began to recognize that the public has an interest in the deployment of broadcasting and telephone communications. The Communications Act of 1934 (U.S. Code, 1934), which created the Federal Communications Commission (FCC), set forth a “public interest, convenience, and necessity” standard¹ for licensing and regulating radio (and later television, broadcasting over the public airwaves), thereby signaling a role for government as a guarantor of public information access. The Act further established the policy of Universal Service, guaranteeing to all the opportunity to subscribe to telephone service at a reasonable cost (Paglin (1989; McChesney, 1993; Mueller, 1997).

Arriving with the 21st century, a networked society precipitates a shift from hierarchical industrial modes to looser, flexible cooperative networks as the dominant social organization of the digital age. Sociologist Manuel Castells (2000) describes networks that offer open, dynamic systems, highly susceptible to non-threatening

innovation. Legal scholar Yochai Benkler (2006) takes that analysis into the marketplace, contending that computer networks shift production into a highly decentralized mode, toward a nonproprietary transactional framework that coexists alongside market-based production. Compared to firms in Coase's day, innovations in the communications environment reduce transaction costs to near zero. Nevertheless, along with the emergence of new enterprises come tensions for traditional power relationships.

THE TENSIONS BETWEEN PUBLIC AND PRIVATE

The tensions between information as a public good available to all and information as a private commodity have given rise to a highly contested policy environment. Different goals—equal access to information so that all citizens can meaningfully participate in public discourse, consumer choice among products and services, and protection of the public from government intrusion into the free flow of ideas—have strained the information chain. A longstanding drive to commodify information goods and services often overlooks a central fact about information: it is neither a pure public good nor a pure private good.

Information is a good that people simply do not use up, as they do other commodities.

When transmitted, information often exhibits network externalities—that is, its value can escalate with increased use (Benkler, 2003; Lessig, 2001; Stiglitz, 1999; Mosco & Wasco, 1988). Commodifying information also overlooks its importance as a constitutive force of society as well as its significance to innovation and creativity (Reichman and Franklin, 1999; Braman, 1989).

The tendencies and tensions of the digital age threaten the business models of commercial content producers. In response, content industries have intensified their efforts to strengthen control over the use of their products, and such controls often come

at the expense of vital “free expression safety valves” within copyright law. Fair use, the first sale rule, and the public domain, balance the public’s interest in open access with the property interests of copyright owners (Litman, 2001; Vaidhyanathan, 2001; National Research Council, 2000; Heins, 2003; Heins & Beckles, 2006).

Many content providers respond to the digital age by using new technologies to control access, others seize opportunities presented by the openness of these technologies to enhance access and innovation. From the early days of the Internet, user-friendly software programs empowered consumers to become creators, producers, and distributors of information. Even before the invention of the World Wide Web, online conferencing systems like The Well, search and retrieval agents like Gopher, online forums like community freenets, bulletin boards and listservs, and newsgroups organized within the Usenet network allowed those with Internet access to generate, receive, and exchange information readily and easily (Reingold, 1993a). Between 1995 and 2000, household Internet access grew from 15% to 50% (NTIA, 2004). In its 1997 Communications Decency Act Decision, the Supreme Court recognized the emerging role of the Internet as a vital communication tool:

Through the use of chat rooms, any person with a phone line can become a town crier with a voice that resonates farther than it could from any soapbox. Through the use of Web pages, mail exploders, and newsgroups, the same individual can become a pamphleteer. ... [In short,] “the content on the Internet is as diverse as human thought” (Reno v. American Civil Liberties Union, 1997, p. 870).

In this same case, the Supreme Court expounded four characteristics of transcendent importance to Internet communications:

- very low barriers to entry;
- barriers to entry are identical for both speakers and listeners;
- low barriers ensure the availability of astoundingly diverse content on the Internet; and
- significant access to all who wish to speak in the medium, creating a parity among speakers (*Reno v. ACLU*, 1997, p. 877).

The four characteristics delineated by the Court embody the inherent openness of new digital information products and Internet services that offer more accessibility, responsiveness to modification, and sharing. When creators share digitized information, other potential users need not be excluded from access, especially when such non-rivalrous resources create new opportunities for decentralized and collaborative production and distribution. With increased openness come standards and protocols that ease the way for interoperability, allowing information to flow freely over the Internet (Committee for Economic Development, 2006). Indeed, David Bollier and Tim Watts (2002) contend that such standards are essential to open and accessible information commons. Another outcome of openness can be found in the open source movement, where computer programmers design their own versions of software, distribute it freely, and foster world-wide collaboration. With openness, the firm no longer serves as the sole model for organizing production. Rather, new structures emerge that facilitate participation, democratization, and innovation. Many, like Eric von Hippel (2005) of MIT, consider user-led developments like the Internet and open source software as

examples of democratizing innovation, part of a broader growing phenomenon of open innovation.

The digitization of content also yields new opportunities as production transforms from a push to a pull economy. According to Bollier (2006, p. 4), a push economy mass produces goods based on anticipated predictable consumer demand that mobilizes scarce resources to push products into the marketplace using standardized distribution channels. John Seeley Brown, the former chief scientist at Xerox Parc, and John Hagel III (2005) argue that the highly specified, centralized, and restrictive nature of push systems inhibits innovation. Conversely, a pull economy consolidates highly uncertain user demand to induce sellers to develop customized products for local or specialized needs that are assembled on an open, flexible platform and distributed through networks. A pull environment necessitates collaborative peer production that undermines the central premise of the firm as a hierarchical structure. Pull platforms harness their participants' passion and commitment into niche communities of interest, creating what Chris Anderson (2006) calls the long tail of low volume products available through online aggregators like Amazon, Netflix, and iTunes. If Anderson's theory is correct, then blockbusters that require huge concentrations of capital may no longer dominate the online retail world. Instead, a pull economy enables niche products to coexist with mass producers, generating such content as blogs, podcasts, and social networking software that is created through a commons-based, peer production model. "Instead of dominant companies using top-down market structures to push and shape consumer demand, the new technologies are enabling the creation of bottom-up, self-organized communities based on fluid and shifting social preferences" (Bollier, 2006a, p. 36). Yet, the shifting

balance between creators and users of content also gives rise to policy tensions expressed with force and fervor in the Courts and Congress.

TRIANGULATING A DEFINITION

The very idea of an information commons, with its connotation of place, can be something of a puzzle for the uninitiated, especially since the same phrase applies to both the singular and the plural; added to which, phrases like knowledge commons, digital commons, Internet commons, and electronic commons appear freely interchanged in both popular and technical discourse. Therefore, with the aforementioned in mind, an *information commons* refers in this essay to information shared by a community of producers and/or consumers. That said, the central fact of an information commons revolves around the question of access to the information available therein; for, much of the debate over the desirability of information commons disputes the degree and management of openness—whether it means free access, no cost access, or unfettered access—all of which come with limitations (Ghosh, 2006, p. 210; Lessig, 2001, p. 76). Indeed, a seemingly straightforward commitment to open access carries implications for institutional design and organization. Consequently, scholars who study the functioning of commons emphasize decisions and rules governing the use of information resources, along with the self-governance structures that manage, protect, sustain, and preserve them. In most studies, there follow questions of equity, efficiency, and sustainability (Hess & Ostrom, 2006, p. 6). Here too, intuitive assumptions do not always follow; whereas, resources like forests and fisheries deplete, people may use and share information commons without exhausting them. In fact, their value often increases with greater use. There are some who consider the whole Internet, or the public domain,² to be

types of commons, even though these are essentially open access resources, lacking the clearly defined group governance that is characteristic of common property regimes.

Others equate the public sphere with an information commons, although the former refers to an ideal for open debate about the public good (Calhoun, 2004, p. 244-245), while the latter focuses on resources. Information commons can be local or global; they can even refer to a place like the information commons that academic librarians and computer specialists create and co-manage as collaborative learning spaces for students (Brown & Duguid, 1998; Lyman, 1999; Lippincott, 2002; Lippincott, 2006; Bennett, 2003, Beagle, 2006; Beagle, 2002; Beagle, 1999; MacWhinnie, 2003).

Whether called information commons or not, initiatives with characteristics of common property regimes continue to emerge. They share features such as open and free access for designated communities, self-governance, collaboration, free or low cost, and attempt to achieve sustainability. They offer shared spaces, real and virtual, where communities with common interests and concerns gather. They take advantage of the networked environment to build information communities where escalating participation boosts the value of the resource. Many are interactive, encouraging discourse and exchange among their members. Most charge little if anything for access. Their participants contribute new creations, and offer strong evidence that they enhance human as well as social capital. They have shared governance structures, with rules and norms defined and accepted by their constituents. They generally espouse self-governance, free expression, and intellectual freedom. Some use the Internet itself as a commons, employing open source software, peer-to-peer file sharing, and collaborative Web sites, while others focus more on content creation and dissemination. And, though not every

example of an information commons adheres to the form, they all represent alternatives to a purely private or public property-driven approach to information and ideas.

It should come as no surprise that authors employing the term information commons rarely conform to all of the dimensions of commons elaborated by theorists such as Ostrom and Hess. After all, a concept taking form invites variation. So, in order to better understand the conceptualization of information commons across multiple literatures, we will examine it within each of four distinct frames:

- (1) enclosure and control;
- (2) openness, freedom and democracy;
- (3) metaphor; and
- (4) decentralized information production.

Although few confine their narratives to just one of these contexts, it is useful to categorize them in order to grasp how definitions vary and to differentiate them from notions like the public sphere and open access.

Enclosure and Control

In this first frame, much of the discourse surrounding information commons arose after users experienced the denial of access to digital information, either as a result of privatization, rapidly expanding intellectual property rights, filters, classification, or some other controls. Initially, few actually referred to information commons when addressing threats to information access; but, over time, it became clear that the full array of threats affected more than just a few resources. Users experienced the crossover of information from open accessibility to government-imposed or corporate restrictions. Some

enclosures were brought on by changes in the physical structure of information, as media changed from print to electronic and analog to digital. Enclosures accelerated during the Cold War when government first computerized data, then privatized it, and then further removed it in the wake of the September 11 attacks. In the private sector, media mergers, telecommunications deregulation, scholarly publishing consolidation, content sharing restrictions, and technological protection measures barred individuals from accessing information they had previously consumed freely. Some enclosures took place rapidly, others more gradually; some took the form of changes in distribution, others responded to economic exigencies. And, as in medieval times, enclosure occurred both piecemeal and by general legislative action, with no single act proving decisive (Yelling, 1977; Turner, 1984; Bradley, 2001).

The first significant enclosure movement began in the 1960s when the federal government contracted with defense industry companies such as Lockheed to develop databases that could manage defense, educational and medical data (Summit, 2002; Borgman, 2000). From within the Military-Industrial Complex, the fledgling information industry soon urged government to curtail or eliminate its own publication programs. Paul Zurkowski, the director of the newly formed Information Industry Association (IIA), forecast an Orwellian calamity: “Just as surely as the Berlin Wall stands today, in the absence of a concerted industry-wide effort, user choice in information one day soon will be replaced by ‘free information’ from one source” (Berry, 1975, p. 795). A decade later, the Reagan Administration eliminated scores of government-produced publications, contracted out then closed federal library and information programs, and placed “maximum feasible reliance” on the private sector to disseminate government

information (Office of Management and Budget, 1985, p. 52736).³ The IIA's privatization strategy succeeded, though not without unflagging public resistance (Hernon & McClure, 1987; McClure, Hernon, & Relyea, 1989; McIntosh, 1990). Government publications in electronic format are now big business, with many no longer produced by the government nor included in standard catalogs, nor distributed through the depository library program, nor archived nor preserved for permanent public access.

The breakup of the American Telephone & Telegraph Company in 1982, plus subsequent government policies favoring telecommunications deregulation, brought a second wave of enclosures. Telephone companies, previously functioning as "common carriers" for information produced by others, expanded into production and distribution, while the cable TV industry moved to provide both connectivity and content (Bolter, 1984; Cole, 1981; Coll, 1986). Thus freed from regulatory constraints, phone, cable, and newspaper corporations pressed Congress for concessions that would lead to positions of dominance in the technological future. Media consolidation proceeded rapidly over the next two decades. (Herman & McChesney, 1997; Aufderheide & Barnouw, 1997; Schiffrin, 2000). At the same time, the computer industry consolidated, resulting in Microsoft's assumption of a dominant market share (Dvorak, 1994; Ellig, 2001; Cusumano & Yoffie, 1998). By the end of the 1990s, a few large corporations oversaw the production and distribution of most of the nation's commercial information.

Amidst this ferment, Congress passed the first wholesale revision of communications law since the Communications Act of 1934. The Telecommunications Act of 1996 relaxed earlier limits on how many radio or TV stations a single company can own, as well as eliminating barriers to cross-ownership of local and long distance

telephone services, broadcast, cable television, and newspapers, all in the name of market efficiency (Telecommunications Act, 1996; Aufderheide, 1999; Hundt, 2000). Yet, despite promises of reduced prices, removed entry barriers, and increased diversity, the 1996 Act resulted in less competition. (Baker, 2002; Cooper, 2003; McChesney, 1999; DiCola & Thomson, 2002; Consumer Federation of America/Consumers Union, 2001).⁴ The number of corporations controlling most of America's magazines, radio and TV stations, books, movies, and daily mass-circulation newspapers dropped from fifty to ten. (Bagdikian, 2000, Zuckerman, 2000). Some observers do argue that the vast resources of the World Wide Web will counteract this trend toward consolidation and top-down control; however, studies at Harvard's Kennedy School of Government suggest that the implementation of the Web's portals and search engines may exacerbate, rather than remedy, the effects of media concentration by making it tougher to find all those independently created resources now available online (Hindman & Cukier, 2003).

A third wave of enclosures came when scholarly societies turned their journal publishing over to private firms, in order to contain membership fees and generate income. With ownership transferred to a few conglomerates, expensive licenses, often requiring bundled or aggregated purchase of titles, caused prices of scholarly journals to soar. By the early 1990's, mergers of academic journal publishers left a few international conglomerates in positions to charge \$20,000 or more for subscriptions to journals like *Nuclear Physics*, *Brain Research*, and *Tetrahedron Letters*, with returning profits as high as 40%, thereby straining already tight higher education budgets (Turner, 2000; Van Orsdel & Born, 2003). In a study comparing commercial to non-profit, academic presses, Carl and Theodore Bergstrom (2004) found that commercial presses charged six times

the price for each page published in journals in the same field by non-profit publishers. Journal costs rose 220% between 1986 and 2003 (as compared to an increase in the consumer price index of 64%) (ACRL, ARL, & SPARC, 2003). This forced research libraries to cut journal subscriptions and purchase fewer books, particularly titles of limited interest or those published overseas. This, in turn, strained the revenues of university presses that traditionally relied on libraries for primary sales.

Initially, price increases were offset by resource sharing networks that facilitated delivery through interlibrary loan, but restrictive licensing agreements undermined these counterbalancing arrangements. And, once journal prices outpaced library budgets, short-term financial gains for the societies quickly gave way to serious losses in terms of access to research results. In effect, academics found themselves in a quandary: universities support research from a multitude of sources; researchers must publish that research in approved journals now owned by a few large firms; research is therefore offered freely in exchange for publication; journal publishers sell published research back to university libraries at astronomical prices (Willinsky, 2005; Hawkins & Battin, 1998; Thorin, 2003; Information Access Alliance, 2003). The irony of the situation was not lost on many.

There was more to come. Publishers and information aggregators began requiring restrictive licensing agreements of anyone seeking to acquire or use digital materials--both copyrighted and public domain--compiled in databases such as *LEXIS/NEXIS* and *Science Direct*. Some vendors forced libraries into complex negotiations prior to electronic purchases, and often require libraries to buy bundled suites of items--many of low interest--if they were to receive titles in greater demand. To be sure, such contracts reflect business strategies aimed at protecting investments in database development;

however, they also centralize control over the flow of information. Pushed aggressively, they eliminate user protections guaranteed under copyright laws, such as fair-use rights to view, reproduce, and quote limited amounts of copyrighted materials (Okerson, 1999). Licensing contracts may even limit libraries from loaning materials to outsiders or archiving and preserving them for posterity; and, because these licensed databases are leased rather than owned, the library has nothing to offer users if it discontinues its subscription, even after it has paid annual fees for many years (Kahin, 1996). When budget cuts come, “The library has no trace of what it bought: no record, no archive. It’s lost entirely” (Vaidhyanthan, 2004, p. 120).

A fourth enclosure tendency follows directly from the aggressive control practices discussed above as firms seek legislative endorsement for their strategies. Congress passed the 1998 Digital Millennium Copyright Act (the DMCA) imposing criminal penalties for circumventing encryption or even distributing circumvention tools. It then passed the Sonny Bono Copyright Term Extension Act (the CTEA), which extends the already lengthy duration of copyright for an additional 20 years, thereby freezing the time boundaries of the public domain.⁵ Other Digital Rights Management (DRM) tools include the broadcast flag, and audio flag, which insert a digital mark that signals conditions allowing or preventing TV and audio programs from being copied. (Center for Democracy & Technology, 2004; Public Knowledge, n.d.). The courts have followed Congress’ lead. In *Eldred v. Ashcroft* in 2003, the Supreme Court rejected a constitutional challenge to the Sonny Bono law, in a decision that seems to give Congress the power to extend the copyright term at will into the future (U.S. Supreme Court, 2003a; Heins, 2003, pps 15-23). The courts have shut down music file-sharing services

like Napster, Grokster and KaZaA, which were sued for contributory copyright infringement. The continuing efforts of the recording and movie industries to shut down file-sharing services, prosecute individuals for alleged copyright violations, and otherwise lock up or enclose information have resulted in a highly-contested policy terrain for information and culture, and chilled the exchange of information (U.S. Appeals Court, 9th Cir., 2001; U.S. Supreme Court, 2003a; Heins, 2003, pps. 35-41). While the public interest, civil liberties, library, and academic communities (Kranich, 2006; Kranich, 2004; ALA-OITP, 2000-2001) have rallied against enclosure, copyright scholars have led the way in articulating how these enclosures affect information commons. Rose (1986 & 1994), Boyle (1996, 2002, 2003), Benkler (1999), Samuelson (2003), Vaidhyathan (2001 & 2004), Lessig (1999 & 2003), and Litman (1990 & 2001) have documented how various copyright rules and other techniques such as Digital Rights Management (DRM) limit (or enclose) public access rights.

One hotly contested control of information access merits separate mention—the Internet filter. Initially designed for home use, filters are now required for use in schools and public libraries, in order to receive federal grant support under the Children’s Internet Protection Act, upheld by the Supreme Court in June 2003. Filters, however, act more like a cleaver than a scalpel; they block thousands of legal and other resources useful to adults, while many banned images slip through. And, though, Congress mandated filters to shield minors from Internet images deemed harmful, public libraries must install restrictive software on all computers, including those used by adults and staff (U.S. Supreme Court, 2003b; National Research Council, 2001; U.S. Children’s Online Protection Act Commission, 2000; United States et.al. v. American Library Association,

et. al., 2003).

As Congressional debate clouds the future of the Internet, some groups promoting open access to information have also aligned themselves behind calls for network neutrality. Telecommunications giants contend that they cannot deploy broadband technologies nor compete without creating separate tiers of service for big content providers willing to pay a premium for high-bandwidth features like video streaming, online gaming, and voice service. Such a system where some providers are favored over others might further disenfranchise public access or non-corporate computer users when navigating a network, thereby limiting their ability to run applications and use services of their choice (Gilroy, 2006; Weitzner, 2006; Net Neutrality, 2006). If access is determined by how much one can pay, small even not so small users might find themselves permanently on the slow lane of the Information Superhighway.

A fifth wave of enclosures struck abruptly in the wake of September 11, 2001, when government imposed a series of measures to lock down “sensitive” information. The USA PATRIOT Act, passed just 45 days after the attacks, greatly expands government secrecy at almost every level, and is at odds with the concept of openness in a democracy. For example, the Act requires that confidential library and book store records be made available to law enforcement review (Kranich, 2003; Leone & Anrig, 2003; Cole & Dempsey, 2002). Even before the law passed, Attorney General John Ashcroft sought to restrict access to government information when he sent a memo to government agencies urging them to refuse Freedom of Information Act (FOIA) requests whenever possible, thus reversing previous policy that denied the release of information only if it would result in foreseeable harm (National Security Archive, 2003). As a result,

the government released less information under FOIA in 2004 than in 2000, with requests processed by agencies falling by 13 percent and overall use of exemptions to withhold information rising by 22 percent (Coalition of Journalists, 2005).

Government also withheld information through the classification process. The U.S. Information Security Oversight Office reported a record 15.6 million documents classified in 2004, an increase of 10% over 2003 and 50% over 2001. In 2005, classifications dropped back to the 2003 level of 14.2 million actions, but still far ahead of previous decades. Correspondingly, the pace of declassification slowed to a crawl, from a high of 204 million pages in 1997 to just 29.5 million pages in 2005 (Information Security Oversight Office, 2006; McDermott & Feldman, 2006). Not only do agencies withhold more information because of perceived national security risk, they also label public data as “sensitive but unclassified,” further restricting access. In March 2002, White House Chief of Staff Andrew Card ordered a reexamination of public documents posted on the Internet, resulting in the removal of thousands of items deemed useful to terrorists (Card, 2002). Yet, terror-related categories used by the government to “take down” sensitive sites are considered so vague by the American Library Association and others that virtually any type of information conceivably related to terrorism can now be withheld from public scrutiny (American Library Association, 2003). About the same time, President Bush issued Executive Order 13233 which bars public access to presidential records already ordered for release (under the Presidential Records Act of 1987) to a limit of twelve years after he leaves office (American Library Association, Washington Office, n.d.)

The Bush administration also reached into the private research arena. In 2003, editors of peer-reviewed scientific journals agreed to withdraw existing articles and reject future submissions that might compromise national security (Statement on Scientific Publications, 2003). Since then, targeted articles have vanished from electronic versions of scientific journals, prompting scholars, civil libertarians, librarians, even the Chair of the 9/11 Commission, to caution that a presumption of secrecy thwarts the openness necessary to accelerate the progress of technical knowledge, which acts against the nation's understanding of potential threats (Shane, 2005; American Association of University Professors, 2003; National Research Council, 2004; Podesta, 2003).

Perhaps inevitably, institutional efforts to control breed their own opposition. One web site and blog, *Beyond the Commons*, challenges enclosure by advocating the public domain as the ultimate commons. Indeed, many who take this approach promote the public domain as a counterweight to privatized information. However, within the spectrum of information access models, the public domain represents an open access regime where nobody has the legal right to exclude anyone else from using the resource—ironically, an approach that may itself suffer the tragedy of the commons. According to Hess and Ostrom (2006, p. 12), when new technologies “capture” resources that were “previously unowned, unmanaged, and thus, unprotected,” stakeholders are prompted to “renegotiate” their interests, leaving some resources vulnerable to overconsumption and depletion (as described by Hardin) if not governed, developed and managed within a framework that can sustain common property resources. In other words, the challenge of information access is not only about enclosure, it is also about managing the resource. Those who view information commons solely through the lens of

enclosure may be trading one set of dilemmas for another. The efforts of over zealous governments and aggressive corporate giants leave a social terrain as uneven as any medieval social hierarchy.

In the first decade of the 21st century, differential access to the Internet and other communications tools excludes many from the benefits of the digital age (Fairlie, 2005). No matter whose data is used to describe the digital divide between rich and poor, between black and white, between urban and rural, between English and Spanish-speaking, between old and young, between new Americans and Native Americans, the gap between those with high levels of access and those without persists across American communities. Though 73% of American adults used the Internet in 2006, with 42% of adults using a high speed connection at home, certain groups continue to lag in ownership of computers and online access. In 2005, online access levels stood at only 32% of Americans age 65 and older, 53% of adults living in households with less than \$30,000 in annual income, 57% of African-Americans, and 40% of those without high school diplomas (Madden, 2006; Fox, 2005). Far too many cannot identify, evaluate, and apply information and communicate it efficiently, effectively, and responsibly--essential skills if they are to learn, advance knowledge, and flourish in the workplace as well as carry out the day-to-day activities of citizens in a developed, democratic society (Kranich, 2007). Even those with access to computers and telecommunications networks often lack the skills necessary to utilize these resources effectively (Hargittai, 2002).

Advocates for the public interest have struggled to protect access to critical resources, balance the rights of users and creators, preserve the public domain, and open public access to all in the digital age; and, although they have fought hard to block

enclosure, they face an uphill battle to influence outcomes in a society that emphasizes individual ownership over sharing of resources.

Openness, Freedom, and Democracy

In this second frame, information commons appeal to those attracted to the promise of openness, freedom and democracy. Embraced by several of the same legal scholars who have studied enclosures, e.g. Benkler (1998, 2006), Boyle (2006) and Lessig (2001), this view of information commons selects their potential as promoters of innovation and creativity. For example, in the blog *The Innovation Commons* (n.d.), contributors examine the ways in which commons foster interdependent creativity by those who join these shared spaces. Boyle and Lessig advanced the innovation notion by launching the Creative Commons and the Science Commons, both founded to offer a set of flexible copyright licenses for public use. Established in 2001 with support from the Center for the Public Domain, these licenses increase the amount of shared sources available online while removing unnecessary barriers to collaboration and innovation. To be sure, Creative Commons licenses do not create bounded collections, self-governance mechanisms, or sustainability mechanisms. They do, however, foster more robust access to high-quality works in a variety of media, as well as promote “an ethos of sharing, public education, and creative interactivity” (Creative Commons, n.d.; Science Commons, n.d., Garlick, 2005).

Like Boyle and Lessig, Benkler also emphasizes the importance of the commons for promoting democratic participation. Quoting the Supreme Court’s decision in *Associated Press v. United States* (1945), Benkler (2000, p. 561) argues that a

fundamental commitment of American democracy is to ensure “the widest possible dissemination of information from diverse and antagonistic sources” (U.S. Supreme Court, 1945). Such a commitment, he contends, requires policies that make access to and use of information resources equally and ubiquitously available to all users of a network. Benkler (2000, p. 568) concludes:

An open, free, flat, peer-to-peer network best serves the ability of anyone—individual, small group, or large group—to come together to build our information environment. It is through such open and equal participation that we will best secure both robust democratic discourse and individual expressive freedom.

Joining copyright scholars in their quest to promote more open access are Lawrence Grossman (1995), Anthony Wilhelm (2000), Douglas Schuler (1996), Schuler and Peter Day (2004), and Bruce Bimber (2003), draw attention to the promises and challenges that face access to cyberspace when in search of wider participation for a 21st century democracy; they consider the commons a critical contribution to a community of shared moral values and social purpose that goes far beyond maximizing economic utility. Librarians and other public interest advocates echo these ideas when they describe the commons as a useful tool for reclaiming public space and promoting the public interest in the digital age (Kranich, 2004a; Kranich, 2004b; Hess, 2000; Lee, 2003). Bollier (2001; 2002b; 2003a; 2003b). Bollier and his colleague Tim Watts (2002, p. 3) explain it thusly: “A commons analysis gives us a way to speak coherently about another matrix of concerns that are not given sufficient attention: democratic participation, openness, social equity, and diversity.”

Similarly, civil society scholars Boyte (1989; Boyte and Evans, 1992), Levine (2006, 2002, 2001), and Friedland (Friedland & Boyte, 2000) underscore the importance of shared information spaces for promoting democracy and the free flow of ideas. Levine (2002, p. 7-8) and Friedland and Boyte (2000), further acknowledge the historic role of institutions including newspapers, schools, libraries, and community festivals as foundations for democratic participation and a collective deliberative voice. To promote and sustain newly emerging information commons, they urge continued sponsorship of and collaboration with these traditional institutions.

The Power of Metaphor

Within the third frame, information commons can be understood as a metaphor. Metaphors drive public discourse because they provide a linguistic context from within which to articulate and understand the dimensions of an issue. To imagine information as a thing elicits a vision of concreteness; which, in turn, lends itself to a logical extrapolation of information as property. To imagine information as a commons elicits an impression of sharing with others, which conveys a sense of giving and receiving. Both metaphors derive from our imaginations, they both share the gravity of acceptance in public discourse; and, yet, each pulls in a different direction. The language of private property ownership has long dominated economic discourse in the United States. But legal scholar Carol Rose (1994, p. 6) counters that property regimes and even individual property holdings are “by no means self-evident constructs;” instead, they are social “arrangements that people have quite consciously talked themselves into.” For decades, those eager to control access to information have successfully employed the language of

property to persuade policymakers and the public of the need to limit access to privately held information. As a result, those standing for greater access face a stiff challenge. If they are to promote the creative, innovation potential of digital technologies, they must offer metaphors that project values central to their agenda—for example, equitable access, free expression, and fair use.

Bollier (2002b) first approached the language of the commons as a response to what he considered unbridled commercialism and privatization of public assets in the 1980s and 1990s. Inspired by the activism of James Love, then with Nader-founded Taxpayer Assets Project, when he took on West Publishing over its monopoly control of the pagination of court cases, Bollier set out to document what he considered the silent theft of publicly owned assets. The language of information commons gave him a vocabulary to explain how the extraordinary public assets invested in our information infrastructure can deliver opportunities for the participation of all citizens. Bollier (2001; 2002b; 2003a; 2006a; Bollier & Watts, 2002) envisioned the commons as a metaphor--a useful framework for promoting the public interest and for helping people recognize what is at stake in the battle to control the flow of information and ideas. He contends that the commons elevates individuals to a role above mere consumers in the marketplace, shifting the focus to their rights, needs, and responsibilities as citizens. Bollier (2002b, p. 6, 8) concludes that

We must begin to develop a new language of the commons... Developing a discourse of the commons is especially important at a time when our market culture encourages us to believe that we have little in common and can accomplish little when we work together... A reckoning of what belongs to the

American people is a first step to recovering control of common assets and using them...to protect them from market exploitation.

But first they must reject the old stories. Whatever story “people have quite consciously talked themselves into,” argues Rose (1994, p. 6), can be replaced by “narratives, stories, and rhetorical devices...essential in persuading people of [the] common good.”—thus, the policy value of the information commons as metaphor (Stone, 1997, p. 148, 156). Those who deploy metaphors to reframe the information access debate take the initiative by embracing the language and values of community, freedom, opportunity and democracy. When they accept the language and assumptions of the opposition, they find themselves ensnared by a linguistic frame that justifies control and enclosure (Lakoff 2002; 2004).

Beyond serving as a compelling narrative, the information commons metaphor offers those engaged in their own information access struggles to come together under a broader, more affirmative umbrella—to create a movement comparable to environmentalism, as a type of “ecosystem for the net” (Boyle, 1997; Benkler, 2001, pps. 84-90). In fact, those fighting to counter enclosures of information commons can learn from early environmentalists whose isolated efforts gained strength when they made “intellectual connections among their isolated phenomena” (Bollier, 2006a, p. 30) and then recognized the power of coalitions and partnerships. (Bollier, 2006a, p. 30) predicts that

The “information commons” may yet play a similar role in our time. It can help us name and mentally organize a set of novel, seemingly disconnected phenomena

that are not yet understood as related to each other or to the health of our democratic polity.

When clearly articulated, the evocative power of information commons rallies opposition to enclosure and implants a vision of a free and open network as intrinsic to the common good.

Decentralized Peer Production

The fourth frame focuses attention on distribution of information through decentralized peer production that bypasses the centralized control of more traditional publishing. Benkler (2003a, p. 1256) considers peer production “a process by which many individuals, whose actions are coordinated neither by managers nor by price signals in the market, contribute to a joint effort that effectively produces a unit of information of culture.” The result is commons-based production of knowledge that, while not challenging individual authorship, fundamentally alters the current system in which commercial producers and passive consumers are the primary players (Benkler, 2000, p. 579). In effect, peer production allows everyone to be a creator, thereby privileging “more idiosyncratic, unpredictable, and democratic genres of expression” (Bollier, 2003c, p. 98).

Collaborative communities with common interests create and disseminate peer-produced information in a way that embodies many of the characteristics of common property resources. Governance is shared, with rules and norms defined and accepted by constituents. Participants contribute new creations after they gain and benefit from access. In addition, cost to participate in these communities may be low, thereby enabling

equitable, democratic participation that encourages interactive discourse and exchange among members. Accordingly, peer produced digital information commons transform the roles of creators and users of digital information. As creators take control over their intellectual assets, their roles change, in the words of Hess and Ostrom (2003, pps. 144-145), “from passive *appropriator* of information to active *provider* of information by contributing directly into the common pool,” where authors around the world are capable of “not only sustaining the resource (the intellectual public domain), but also building equity of information access and provision, and creating more efficient methods of dissemination through informal, shared protocols, standards, and rules.” Ultimately, networked environments provide opportunities to build real and virtual communities where greater participation increases the value of the resource.

INFORMATION COMMONS IN ACTION

The idea of an information commons is neither intuitive nor self-evident. Individuals first encountering this discourse must digest the metaphors, learn the language, and come to terms with the abstractness inherent in the concept. That such a daunting concept has gained traction says much for the resolve of those determined to stem a trend that seems inexorable. Nonetheless, the proof of the idea is in the practice. The following examples illustrate challenges, opportunities, and proof.

Open Source

The development of open source software illustrates the values of openness, freedom and democracy, as well as decentralized production. Applications such as GNU/Linux (Moody, 2001; Linux Online, n.d.) can be acquired without the restrictive

licensing provisions of commercial software (Benkler, 2002; Weber, 2004). Most open source software, while not in the public domain, is available for little or no cost and distributable without restriction. End users may review, use, and modify the source code without payment of royalties, as long as they share changes with the open source community. The code is protected by a special license so that improvements cannot be redistributed without the source code (Red Hat, n.d.; Samuelson, 1996; Boyle, 2003a). The GNU General Public License (GPL), developed by Richard Stallman at MIT in the 1980s (Schweik, 2006; Goetz, 2003), guarantees that users have the freedom to use, distribute and modify software. His principle of “Copyleft” applies to most of the software distributed by the Free Software Foundation, the organizational sponsor of the GPL Project, and to any other program whose authors commit to using it. When users distribute copies of such programs, the Copyleft license requires that they give the recipients all the same rights and make sure that they receive or can get the source code. Open source, thus, preserves the digital commons, while ensuring that breaches in licensing terms are subject to rules and an enforcement regime. A prototype for other information commons, open source harnesses the distributive powers of the Internet, parcels the work out to thousands, and uses their contributions to build and improve the software, while allocating entitlements within the scope of copyright law (Van Wendel de Joode, Bruijn, & van Eeten, 2003; Stallman, 1999).

Biologists have applied the paradigm of open source to build massive databases, such as genetic sequencing, that are essential to lab research (Quackenbush, 2003; Carlson, 2000). NASA uses open source principles for its Mars mission, with the help of volunteers who identify craters and map the planet (NASA Ames, n.d.; NASA Mars, n.d.;

Szpir, 2002; Goetz, 2003). Prentice Hall publishes a series of open source computer books that readers can modify and redistribute (Shankland, 2003) and Project Gutenberg Distributed Proofreaders (n.d.), uses open source to contribute to a respected online archive of works that are in the public domain.

Democratic Participation

When information communities promote civic engagement among youth, they take up the challenges that come with the promotion of democratic participation in virtual space. Notable examples come from St. Paul, Minnesota (St. Paul Information Commons, n.d.), and Prince Georges County, Maryland (Prince Georges County Information Commons, n.d.). Peter Levine considers such commons noteworthy because they achieve complex goals without control by bureaucrats, experts, nor profit-seeking companies. Moreover, they encourage diverse uses and participation. Yet he also recognizes the vulnerability of such endeavors, especially if they fail to adopt appropriate governance structures, survive rival alternatives, and avoid anarchy that can result in the tragedy of the commons (Levine, 2002, p. 5-7). What is different about these civic engagement commons is that the very process that creates them builds social capital, strengthens communities, and teaches skills for effective citizenship (Levine, 2006, p. 247).

Scholarly Commons

Examples of information commons developed to counter enclosure abound in the realm of scholarly communication where learned communities have created alternative approaches to managing and disseminating their collective knowledge resources.

Foremost among them is the Scholarly Publishing and Academic Resources Coalition (SPARC) (n.d.), founded in 1998 as an alliance of research libraries, universities, and organizations. Formed as a constructive response to market dysfunctions (enclosure) in the scholarly communication system, SPARC helps incubate alternatives to high-priced journals and digital aggregated databases, publicize key issues and initiatives, and raise awareness among the scholarly community about new publishing possibilities. Another approach to solving enclosure problems with scholarly publishing is open Access (OA), which promises to make scholars' ideas more readily available, reduce costs, and slow the commercialization of online scholarly literature. Peter Suber (2006; 2003, n.d.), editor of SPARC's *Open Access Newsletter*, describes how adopting new standards and structures will not only reduce costs, but also overcome barriers to access such as restrictive copyright laws, licenses, and DRM (McKiernan, 2004; ARL, n.d.; Prosser, 2003). Malcolm Getz (2005) predicts that open access will show significant results within five years and become the dominant mode of scholarly communication in 10 years. For scholars, free availability of open access publications over the Internet has dramatically increased the sharing of ideas, with citation count increases of 50% to 250%, ensuring greater impact and faster scientific progress, particularly beyond the borders of North America and Europe (OpCit, 2006; Lawrence, 2001). Among the nearly 2500 open-access journals now distributed are titles as diverse as *PloS Biology* and *PloS Clinical Trials*, *Cell Biology Education*, *Journal of Arabic and Islamic Studies*, and *The New England Journal of Political Science* (Lund University Libraries, n.d.).

Another scholarly commons, the Open Archives Initiative (OAI, n.d.), was launched in 1999 to provide low-barrier, free access to digitized research articles through

digital repositories. OAI utilizes standardized descriptive cataloging (or metadata) to facilitate the efficient dissemination of scholarly papers. OAI enables a number of universities, disciplines, and individuals to share scholarship, take a more active, collaborative role in modernizing scholarly publishing, and provide an unprecedented alternative to the limited access dictated by ever-more restrictive copyright legislation, licensing agreements, and technological protection measures utilized by many scholarly journals. This effort is boosted by articulation of the characteristics and responsibilities for large-scale, heterogeneous collections, which help digital repositories provide reliable, long-term access to resources (Research Libraries Group, 2002; Hess & Ostrom, 2003).

According to Clifford Lynch (2003, online) institutional repositories emerged “as a new strategy that allows universities to apply serious, systematic leverage to accelerate changes taking place in scholarship and scholarly communication.” By taking the initiative, universities move “beyond their historic relatively passive role of supporting established publishers,” and enables them to explore “more transformative new uses of the digital medium” (Wofford, 2003; Lynch, 2003; Marx, 2003, MIT DSpace, n.d.; MIT OpenCourseWare, n.d.).

Academic disciplines have also created a rich array of digital repositories. The first, the Los Alamos ArXiv.org, established in 1991 by physicist Paul Ginsparg, provides low-cost access to scientific research papers in physics and related fields before peer-review and subsequent publication in journals. This open access, electronic archive and distribution server, now maintained by the Cornell University Libraries, receives as many as 300,000 queries per day, and includes more than 350,000 papers (Los Alamos E-Print

Archive, n.d.; Ginsparg, n.d.). Papers located on the ArXiv.org e-print service are now cited about twice as often as astrophysics papers that were not (Schwartz, 2003).

Following the success of ArXiv.org, numerous other disciplines have created repositories such as EconWPA (n.d.), the Oxford Text Archive (n.d.), the PhilSci Archive (n.d.), the Networked Digital Library of Theses and Dissertations (n.d.), the Conservation Commons (IUCN, n.d.) and the Digital Library of the Commons (n.d.).

Individual authors are also distributing their own scholarly papers through personal Web sites or self-archiving. By retaining rights to archival copies of their publications, scholars become part of an international information community that increases access and benefits for everyone. According to Stevan Harnad (2003; n.d.) and other researchers at the RoMEO project (SHERPA/RoMEO, 2006) at the University of Loughborough in England, at least 70% of journals officially authorize self-archiving, and most others will permit it upon request, demonstrating the dedication of many scholarly publications to promote rather than block research impact. The more that research is read, used, cited, and applied, the greater the impact (Project RoMEO, n.d.; E-Prints, n.d.).

Digital Research Libraries

The decentralized, peer-production features of digital networks have prompted research libraries to develop digital commons by converting works to machine-readable form from their retrospective collections, purchasing and linking to distributed electronic resources, establishing standards and best practices for describing and preserving electronic materials, and teaching the skills users need to utilize these new tools. Only in

the last few years have these digital libraries become collaborative, community-based endeavors (Greenstein & Thorin, 2002; New Digital Initiatives, 2003). While authors and publishers have challenged some of these collaborative partnerships, like Google Print (Carlson & Young, 2004; Markoff & Wyatt, 2004; Vaidhyanathan, 2005), on the basis of copyright infringement, a different model under development by the Open Content Alliance (OCA, n.d.; Open Content Alliance, 2005) is structured to provide universal electronic access to public domain or otherwise open access collections from multiple research institutions. To ensure permanent public access to licensed (leased) subscriptions that reside with publishers, research libraries are experimenting with community-based preservation projects that create trusted third-party agents to store and archive publishers' content (Waters, 2006). Portico sets up a new organization to preserve publishers' electronic source files. LOCKSS (n.d.) for Lots Of Copies Keeps Stuff Safe, relies on the collective action of libraries working with publishers to share responsibility for copying and storing journal content, using a common infrastructure for systematic capturing of files.

Private and non-profit digital library initiatives aim to open up research collections to a broader audience of users. As commons-based digital libraries, they promote a sustainable, equitable, and trustworthy source of knowledge for generations to come. Growing from fragmented local experiments to vast global initiatives, these efforts integrate a wealth of trusted interdisciplinary and multi-disciplinary resources managed under common property or open access regimes. As a result, consumption of these resources results in more (not less) production of new ideas, without excluding potential beneficiaries (Coleman, 2006).

Collaborative Reference Tools

Digital reference publications such as *Wikipedia* (n.d.a) offer another example of information commons developed as decentralized peer-produced commons. An online encyclopedia that enables anyone to contribute and/or edit content, *Wikipedia* and similar commons are among the most successful collaborative enterprises to emerge through the World Wide Web. Founded by Internet entrepreneur Jimmy Wales and managed by the non-profit Wikipedia Foundation, the reference work has close to 1.5 million entries in English, and versions in 250 different languages. Although highly publicized critics contest the quality and reliability of *Wikipedia* content (Duguid, 2006), a study published in *Nature* found little difference in its accuracy when compared with articles in the *Encyclopedia Britannica* (Giles, 2005). Benkler (2006, pps. 70-74) notes that this venture relies on social norms to ensure reliability and objectivity, as well as the trust built among its thousands of contributors and millions of readers. Whether or not users trust this resource, the *Wikipedia* model has diffused to other applications including *WikiBooks* (n.d.), a collection of free open content books that users can edit, *Congresspedia* (n.d.), the "citizen's encyclopedia on Congress," *SourceWatch* (n.d.), a reference tool covering public agenda issues, and *flu wiki* (n.d.), a pandemic flu resource. A similar dynamic but more scholarly undertaking, *The Stanford Encyclopedia of Philosophy* (n.d.), is one of many peer-produced tools maintained and kept up to date by a network of experts, though paid for by scholars and libraries following the open access model (Zalta, 2006).

Social Networking Commons

Finally, no discussion of peer-produced information commons should proceed without mentioning participatory, social networking media or “pull” software that is transforming the way people interact, news gets reported, and communities engage. Also known as Web 2.0 technologies, these include web logs, or blogs, that look like Websites but with journal-style entries displayed and archived in reverse chronological order. Readers can comment and interact with owners of blogs and create communities of interest around specialized topics. And, in one manifestation of the revolution in news brought about by the Internet, a number of bloggers have led the news media by breaking stories that would otherwise go ignored by the mainstream press (Blogs, n.d.). The popularity and importance of this form of social networking is immense; the number of blogs doubles every six months and 75,000 new blogs are launched daily (Burns, 2006).

Part of the reason blogs are so ubiquitous stems from the ease with which readers can follow posts by subscribing to their favorite websites through RSS (Really Simple Syndication) feeds that retrieve new items as they are posted. Electronic news aggregators like Digg and Reddit “pull” posts of interest that readers can readily sort, review, organize, and discard. Collaborative filtering of feeds allows readers to share recommendations with people holding similar interests (Wittenbrink, 2005). Other social networking software like MySpace, Facebook, YouTube, Flickr, and Podcasting enables people to contribute their own content, capture and disseminate knowledge, and create their own radio and television broadcasts. Unlike market structures that push demand, these “bottom-up self-organized communities” arise “based on fluid and shifting social preferences” (Bollier, 2006a, p. 36). With social networking tools, intelligence gathering becomes a collective endeavor, innovation comes from the edges, and a clever person

with a blog can gain a remarkable level of visibility and exposure. Their very popularity, of course, makes them delectable to corporate appetites. The question remains, therefore, as to whether these open, egalitarian modes of information production can be sustained as common pool resources, once bought up by multinational corporations like Rupert Murdoch's News Corporation.

Governance

Democratic control over the creation, dissemination, and preservation of information demands appropriate governance. To this end, Ostrom and Hess (2006; Hess & Ostrom, 2003) offer a useful framework. Self governance requires:

1. definition of boundaries (which tend to be “fuzzy”),
2. design and enforcement of rules,
3. extension of reciprocity,
4. building of trust and social capital,
5. delineation of communication channels.

Because information commons resources are necessarily diffused, their dispersal requires stewardship of a kind that transcends space and traditional organizational structures. Stakeholders must negotiate principles *and* procedures, often within the institutional culture giving birth to the commons, whether it be libraries, archives, or scholarly societies (Ostrom & Hess, 2006, pps. 50-53; Lougee, 2006, pps. 311-332). Others, acting independently like Wikipedia (n.d.) and DSpace Communities (n.d.), carve out new structures for control from within their own cultural traditions and experiences. Thus, all projects develop rules and structures for governance, whether tacit or explicit;

however, if they are to maintain and sustain their activities, they must convert informality into documentation.

Collective action organizations, such as open access publishers, digital repositories, and digital libraries, face the challenge of developing governance structures that channel motivations toward democratic participation, and away from the exploitation that leads to the tragedy of the commons. That is, they must raise difficult questions. For example, What are the boundaries of the effort and what are its priorities? What role will contributors play? How will rules be negotiated? Who will determine the scope and effectiveness of activities? What kinds of reciprocity will be required for sustaining these activities? What kinds of channels will maintain communication and facilitate action? And, ultimately, will the venture build trust among its stakeholders?

Collaboration is essential to the successful introduction, development, and widespread utilization of information resources. In the past, authors, publishers, librarians and readers cooperated, but collaboration means something far more demanding than these customary relationships. A commonly held mission and goals, new organizational structures, comprehensive planning, additional levels of communication, authority structures with dispersed leadership, shared and mutual control must come together for effective governance. If they are to evolve into more open collaborative organizations, information commons will need new organizational frameworks, with serious commitments by administrators and their parent organizations, who must broker new relationships, entrepreneurial activities and communication structures. Yet, while these new relationships stir us with vistas of a brave new world, they face real-life pitfalls, such as conflicting institutional priorities, competition for scarce funding, or

unwillingness to invest fully in the retooling necessary for traditional information creators and providers to preserve their existing roles, as well as make the transformation into collective-action organizations.

Finance

Developing, sustaining, and governing information commons also requires significant investing in infrastructure and content, especially if the effort takes place within an institutional setting. While users may gain more free or low cost access, someone must still pay to sustain resources. Moving, for example, from an unsustainable subscription-based structure will shift long-standing financial and social relationships. To date, information commons have benefited from support by individuals, foundations, and other grant-making agencies; nonetheless, benefactors like the Mellon Foundation and the Open Society Institute are unlikely to continue subsidies indefinitely. Originators of commons have demonstrated remarkable ingenuity when it comes to getting their projects off the ground, but the course ahead remains to be mapped.

Consider open access publishing, which shifts the burden of production expenses from purchasers to creators. Rather than charge subscriptions, some open access publishers collect author and/or membership fees. Such transitions require capital for starters, and then streams of revenue for sustainability. One publisher, BioMed Central (BMC), began by offering electronic journals to libraries on a flat fee basis, but later substituted membership renewal fees based on the estimated number of articles generated by each faculty (Evolution in Open Access, 2004). That is, the more productive a faculty, the higher the membership fee to the institution. Not surprisingly, some participating

institutions balked at steep rises in fees. So, while many of the parties agree that the old financial models do not work, new models based on productivity and membership may fail to solve all the problems they were designed to fix.

For universities especially, financing the transition from a subscription to a production-based business model tests an institution's ability to find additional funding. . New publishing ventures on or across campuses that involve libraries, academic presses, technology centers, and scholars require carefully designed business plans. Low cost journals and digital archives may be welcome, but they arrive at a moment when libraries and universities face serious budget constraints that limit their ability to pay for long-standing commitments, let alone take on new ventures. At the same time, universities must redirect resources if they are to become publishers as well as consumers of their faculty's scholarship. After all, authors need to become aware of the incentives and rewards available to them when they migrate to new publishing ventures that may demand high publication fees. Moreover, professional societies and other publishers need new revenue streams that compensate for the loss of commercial revenues. As the Committee on Institutional Cooperation (CIC, 2003) has recommended, new efforts to improve scholarly communication must build upon inter-institutional relationships already underway. The challenges to sustaining new information commons like open access publishing show the difficulty of transforming to new production models, even though the benefits are substantial.

Participation

Self-organized commons need strong collective-action and self-governance mechanisms to succeed (Ostrom and Hess, 2006); they demand substantial social capital from their stakeholders. In the sense coined by James Coleman and popularized by Robert Putnam (2000) in *Bowling Alone*, social capital can be thought of as the “values and social networks that enable coordination and cooperation within society...the relationship between people and organizations, which form the glue that strengthens civil society” (Marschall, 1998, p. 24). Thus, for voluntary groups to achieve a shared goal, norms of reciprocity must be embraced by their members. Otherwise, information communities face challenges to participation and engagement, by a small number of activists who often dominate proceedings. As the information environment of a one-to-many broadcast model gives way to a many-to-many common platform, social relations shift from locally embedded, thick, unmediated and stable, to a more fluid, bridging, weak-tie model. The networked society that fosters peer production and social interaction structures relationships on social norms at a distance and across interests, as well as contexts. The commons endeavor manifests a nonhierarchical and decentralized social structure, bringing together otherwise unconnected people around a similar purpose and common pursuit. In effect, states Benkler (2006, p. 375), “Individuals who are connected to each other in a peer-production community may or may not be bowling alone when they are off-line, but they are certainly playing together online.”

Why do people participate in these endeavors? An expansive literature led by Barry Wellman (1999; Wellman, Boase & Chen, 2002; Wellman & Haythornthwaite, 2002), Howard Rheingold (1993b), Mary Chayko (2002), Mark Smith and Peter Collock (1998), and Leslie Shade (2002) reveals the many ways in which the Internet decreases,

increases, and/or transforms community, but has less to report on the motivations that prompt participation in this form of gift economy. No doubt, people need incentives to contribute to joint endeavors; and, while a few popular shared endeavors like MySpace and YouTube spontaneously foster high levels of participation (or obsession, as some charge), others such as digital repositories experience difficulty generating wide-scale support from potential contributors (Ostrom & Hess, 2006, pps. 54-57). Yuan, et. al., (2006) developed and tested a model to assess motivations to participate in organizational information commons, which found that social influence and technology-specific competence are positively related to use of collective repositories.

Karen Fisher and Joan Durrance (2003; 2001) examined how information communities make available their information resources, in order to unite people around common interests. They describe five characteristics that distinguish Internet-based information communities:

1. information-sharing with multiplier effects;
2. collaboration;
3. interaction based on needs of participants;
4. low barriers to entry; and,
5. connectedness with the larger community.

In online communities that share production and distribution of information, they found members more likely to experience increased access to and use of information, increased access to people and organizations, and increased dialogue, communication, as well as collaboration among information providers and constituents. For communities so organized, the Internet functions as a hub that facilitates the exchange of ideas, the

distribution of works, plus links with others who have similar interests and needs—in other words, connections and collaborations. As with governance and finance, social ties and competence factors need further investigation. Finally, and most difficult of all, longitudinal studies will determine how these factors evolve over time as technologies, capabilities, and familiarity change. For researchers, questions of governance, finance, social ties, competence, and longitudinal consequences are just now taking shape.

INFORMATION COMMONS AS A RESEARCH FRONT

To suggest that new models for creating and distributing digital information appear daily constitutes but a small exaggeration, for we live in a time when the idea of information captures the imagination. The simple fact of identifying these models as commons contributes to their development by associating them together within a prevalent framework for analysis. Indeed, this essay testifies to an extraordinary blossoming of innovations that bring people together as participants in a shared system of information creation, distribution, and consumption. And, as with any crucible of ideas, questions outnumber all else. Most assessments of commons come with underlying assumptions applicable to earlier systems where the distribution of physical resources generates tensions between the market and the state. Only now, has a research front begun to materialize as researchers take up the information commons on its own terms (Hess & Ostrom, 2006, p. 29-30). The emerging front manifests interdisciplinarity and synthesis. Ostrom and Hess (2006; Hess & Ostrom, 2003), for example, have taken the Institutional Analysis and Development (IAD) framework for commons theory--developed over three decades--and adapted it for multidisciplinary study of knowledge commons. Take the case of digital repositories. Through the IAD, they document

attributes of community, rules, rights, incentives for participation, patterns of interaction, efficiency, equity, governance, communication, infrastructure, and conflict management; that is, they attempt to record the full array of factors that influence the behavior of a commons⁶ (Ostrom & Hess, 2006; Schweik, 2006; Schweik & Semerov, 2003).

Clearly, the ubiquity of information commons belies the challenge of understanding them, hence the importance of asking the questions that intersect to form a research front, a catalog of which begins with the following:

1. Rights: How should intellectual property be construed? Should communal rights to information have standing?
2. Enclosure: Where are the new enclosures? What are their consequences?
3. Access: Who are the actors? How do they behave as creators, distributors, and consumer? How do they behave toward each other?
4. Governance: Are these commons equitable, efficient, and sustainable? How can their communities avoid the tragedy of the commons? Why do some efforts succeed and others fail? Are there best practices?
5. Metaphor: Can a language of rights and communalism evolve capable of establishing a frame from within which to promote commons? Are there metaphors upon which to build and sustain policy?

The marrow of research is inquiry, and the pith of inquiry is imagination; whence, no litany of questions can claim comprehensiveness, nor does this one pretend to do so. At best, it contributes a point of departure.

CONCLUSION

New technologies, new forms of work, new resources, and new ways of thinking—the sensibilities of the information age—have brought with them the need to organize and share information. Some of these solutions we now call information commons. While these commons will replace neither the private nor the public sector of the information society, they promise to advance learning, enhance civil society and foster democratic participation—a brave new world. Scholars, practitioners and activists increasingly embrace the metaphor of the commons as a tool for promoting civic virtue and social purpose in the digital age. In the cause of decentralizing the production of information, they hope to enable openness, freedom and democracy. As free and open shared resources, however, these dynamic, and complex phenomena require resources, governance and the right language, in order to ensure sustainability. Ultimately, information commons offer the promise of paradox: to share without owning; to own without enclosing; to take by sharing.

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Endnotes

¹ The "public interest" is not defined in the 1934 law, the Telecommunications Act of 1996, or other federal statutes that use the term. Although the nature of the public interest may be difficult to determine (Barry, 1962, p. 203), one scholar defines a public interest policy as one that, "at least in the long run, affects everyone in an equally beneficial manner, receives public support through a principle of unanimity, and has costs that are widely and equally shared" (Dennis, 1981).

² The legal scholar David Lange and others assert that the public domain is most usefully seen as a commons, which has been restricted by copyright term extension, privatization, licensing, DRM, and proprietary databases such as Lexis/Nexis. (Lange, 2003; Benkler, 1999). This commons is more like the open-access regimes that are prone to Hardin's tragedy of the commons.

³ When the policy was revised in 1993, it eliminated the phrase "maximum feasible reliance on the private sector."

⁴ To be fair, this interpretation is not without its critique. For an argument that disputes claims of declining competition, see Compaine, 2000; Compaine, 2004; Brock, 1998; Hazlett, 2000; Knee, 2003

⁵ The public domain consists of works whose copyrights have expired as well as works that, like government resources, were never covered by copyright.

⁶ Ostrom and Hess (2006, p. 70) cite numerous other studies that analyze various dilemmas of knowledge commons. These do not apply the IAD framework, however.