

# Exclusive Rights in Information and Mobile Wireless Mass Media

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## 1 Introduction

I had some misgiving when I was invited to write a chapter on the implications of exclusive rights in information (ERIs; more commonly known by the less analytically neutral term “intellectual property rights”, or IPRs) for the future of delivery of mass media content to mobile wireless devices. This is, to some extent, a futile project, as I do not actually think that the correct way for mobile wireless data communication to go is a replication of the mass media model. Quite the contrary, that is a model that I have spent a good deal of writing arguing is economically inefficient and normatively unattractive (Benkler, 1998, 2001, 2004). What I propose in these pages, therefore, is to provide a descriptive account of the ERI implications for any business model that could seriously be called mass media delivery to mobile wireless. I will then sketch my objections to such a business model, suggesting instead that the core of mobile wireless communications should be, and will be, the provision of high-speed mobile Internet access through equipment that will enable license-free, network-owner-independent communications, not mass media. Adopting such a model will render the issues that are of concern to a mass media model irrelevant to mobile wireless.

## 2 Rent-Seeking Politics, Not Rational Policy

As we look at the different regimes for copyright licensing and royalty regimes, we see that each new technological development offers a new battlefield. The

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owners of copyright operate from the presumption, reasonable from their perspective, that they ought to get as high a return as possible from every new market segment opened up by a new technology of transmission. Carriers, service providers, and equipment manufacturers, on the other hand, want to maximize the value of whatever system they are selling by using it to transmit as much content as possible, at as low a price as they can. The result has been a series of battles ranging from the introduction of player pianos to radio, television, cable, satellite, and the Web. There is no unifying principle behind the resolution of these, no single template. There is a general range of possible outcomes, ranging from “copyright holder controls transmission at will” to “copyright holder has no right”, but often settling on some form of compulsory license with some level of royalty. The contours of the license requirement and the rate of the royalty are generally determined by the political jockeying rather than by specific application of general principles.

## 2.1 Parameters of Constraint

### 2.1.1 Two Ideal Type Business Models

To motivate the analysis, let us adopt two opposite visions of mobile wireless delivery of mass media content. At one end of the spectrum is a business model that may be conceived of as the “*Glorified Car Radio*” (GCR)—mobile devices available purely for push content delivery selected by the content provider. Interactivity is minimized. Similarly, adaptability and functionality are constrained. The GCR model focuses the role of the consumer as a largely passive recipient of information, whose role in the system as payor, rather than a source of value into the system, except where the recipient him—or herself is the product sold to advertisers.

At the other end of the spectrum are business models that provide a form of high-speed mobile Internet access, whether in an owned network or on an open wireless network that is ownerless, and built purely of collaborating end-user devices (Werbach, 2001; Benkler, 2002, 2004). The most visible current instantiation of this model are the examples of 802.11x family of standards, or WiFi networks, described by other chapters in this volume, and can also be seen in various proposals to enhance the currently limited web access and e-mail presently incorporated into most cellular devices. As handheld devices become increasingly integrated and PC’s more seamlessly wireless the line between handsets and PCs begins to blur. “Equipment” here correlates with the wide-spanning functionality and adaptability of the desktop PC—encouraging a variety of uses, the transferability of content, and the expan-

sion of applications—and the mobility of handsets. Equipment and services are built flexibly to adapt to the needs of the user, rather than optimized to deliver content selected by a provider to the user. Networks are designed to be network owner-independent.

This *Mobile High-Speed Internet Access (MHIA)* business model lends itself to a variety of services, both push and pull. Content may take advantage of the location-oriented needs of mobile consumers. Services may also provide the entertainment content delivered via traditional mass media mechanisms. Critically, however, such proprietary “mass media” content is to be accessed and delivered with equal weight alongside non-proprietary content and personalized interactions. In its pure form, then, this model puts a premium on the characteristics we find in dial-up access to an open web: a user-controlled environment that promotes, rather than curtails, interactivity, and choice. One obvious impure form would be a model that offers Internet access, but introduces constraints on the flexibility afforded to users at the equipment-end in order to privilege certain content—say, affiliated content—through preferential delivery. That is to say, an impure model is aimed at evoking the potential pressures from the mass media model on the Internet model that one sees presented in the open access debate over cable broadband.

The general layout of the constraints that the law will place on different providers of wireless mobile communications will largely depend on how close a given business model is to one or the other of these pictures. These will inform and shape the type of constraints that courts and legislatures are likely to place on providers.

## 2.2 Core Determinants of the Shape of Regulatory Intervention

There are three elements to mobile wireless delivery, which in combination will lead a business model to look, from the copyright perspective, more like a GCR or more like a MHIA service. These are (1) the end user device, (2) the transmission infrastructure, and (3) the content. One can organize the relationship among these three components in a number of ways, corresponding to the extent to which each component is tied to another and owned by a service provider.

The transmission service provider either controls the device or it does not.

The infrastructure owner either controls the delivery service (dedicated ISP or cable services, etc.), or it does not (open access or common carriage interconnection).

The device either controls the content (strongly through hardware limitations or weakly through startup defaults), or it does not.

The infrastructure owner either controls the content delivered (completely as in TV or weakly as in default gateways), or it does not.

While obviously it is analytically possible to combine these parameters into more combinations, it is sufficient to consider the outlines of a number of prototypical business models that need to be considered from a policy/law perspective given these characteristics:

**Radio and Television Terrestrial Broadcast model:** The device is dedicated to the infrastructure service, the infrastructure is dedicated to use by one or a set number of providers, the service provider controls the content on its service.

**Cable Broadband ISP:** The device is dedicated to the infrastructure service, the infrastructure is dedicated to use by one service provider, the content is shaped by the infrastructure service through gateway defaults, but is otherwise on an Internet-pull model.

**Dial-up ISP model:** The device is not dedicated to the infrastructure service, but rather can be used to connect to any infrastructure service within range, the infrastructure is not dedicated to one service provider, and the content is on a pull-Internet model.

**Mobile DVD players:** The device is dedicated to a particular type of content; the infrastructure is competitive and not dedicated to the content (that is, Walmart and Tower Records can compete on distribution).

**Bloomberg Radio (modified):** As a sales gimmick, Bloomberg Media distributed free little AM radios that could only be tuned to one station—Bloomberg Radio. This, in modified form, stands for the model where the end-user hardware is hardwired, or at least its software is dedicated, to specific content

- which can be transported over infrastructure owned by the hardware and content vendor
- or can be devised so that it will always deliver stated content irrespective the transmission infrastructure to which it is connected.

Models that will operate closer, along the spectrum of transmission models, to the GCR model, will operate in a space defined by the permission/compulsory license/royalty set of concerns. The baseline question for any commer-

cial business model built around pushing commercially produced mass media content to mobile consumers is, therefore, whether it needs to negotiate a license with the copyright owners, or whether it can fall under some framework for a compulsory license with a statutorily-fixed royalty.

The conclusion with regard to the general category of GCRs—that is to say, devices that push content to consumers over infrastructure owned by the programmer—is that it is possible that the transmissions will be deemed to have fallen under a category of service already covered by a compulsory license, in which case one would want most to be treated like terrestrial broadcasters carrying audio, or like cable companies retransmitting broadcasts. The terrain is treacherous however. The basic approach of the content industries, quite justifiably from their perspective, is to fight any new technology of retransmission or broadcast as though it were a new battle, where the other side is not as strong as the incumbent terrestrial broadcasters, so as to limit the compulsory license to a bare minimum and to raise the royalty to a maximum. The same is likely to apply to mobile wireless delivery, were licensees could in principle try to claim to be FCC licensed “terrestrial broadcasters,” but that would be a very weak argument unlikely to be accepted by courts. More likely, a new regulatory proceeding to determine the appropriate licensing fee would be required.

The set of constraints and considerations are different when the wireless service provider moves further away from the glorified car radio model, and toward a mobile high-speed Internet access model. Here the framework of the newly emerging technology control laws pushed by the copyright industries—mostly the DMCA and other modes of ISP or service provider contributory liability theories—as well as the looming hardware design control statute—the CBDTPA—are most relevant. The more the infrastructure is available for users to pull and exchange content of their own choosing, however, the further away we get from something that could properly be called “mass media” delivery of content.

The baseline concern for liability in the MHIA model is the background contributory liability from copyright law. If the users use the provider’s facilities in ways that violate copyright, there is some concern that this will result in contributory liability suits. In the early 1990s there were a number of suits in copyright as well as other contexts on this theory against ISPs. The paradigm case, though, is not a service case but an equipment case, in which the movie industry sued Sony to stop distribution of VCRs. The suit failed, on a theory that the VCR had a substantial noninfringing use, to wit, allowing users to tape television programs that were broadcast when they were not at home, so they could watch them at a more convenient time. The case was later applied at an appeals-court level to permit mp3 players, against a structurally similar suit by the recording industry. These cases suggest that any generally usable

high-speed service, not dedicated in some important way to copying and distributing copyrighted materials, will be safe.

Above this baseline level of potential liability, there are specific arrangements introduced by the DMCA. Here, a true exemption from liability as an ISP applies to providers who are purely “carriers.” But as the service bundles more value added services, like a portal, search and indexing functions, and so on, other conditions apply, primarily the notice-and-takedown approach. That is, if the content provider knows of infringing content that is flowing over the ISP’s system, and notifies the provider of the content, the ISP has to remove the infringing content. This was all well and good for a framework that depended on ISPs to store the delivered content, so there was always an ISP that had actual control over the storage space from which the offending materials were uploaded. The introduction of peer-to-peer technologies after the passage of the DMCA threw something of a monkey wrench into this mechanism. Napster was the example of a service provider that matched users to each other, but had no control over the content itself, and found it practically impossible to block the offending traffic.

This is not at all to say that all ISPs over which peer-to-peer occurs will be liable like Napster. A service provider that simply provides infrastructure, as mentioned, is immune even to notice and takedown requirements. But as value added services are added, as capacities to monitor traffic and control it increase, the service provider approaches liability for infringing materials carried over its network, even when it neither originates the content nor facilitates its delivery in any specific manner, other than offering general location devices and transmission capability. Failure to practicably implement a mechanism to control users’ use led, at a practical level, to the closure of Napster.

The overall policy conclusion is that the further away high-speed mobile data services move from pure ISP service, the more they are engaged in controlling the information flow to their consumers, the more likely they are to be liable under copyright, and the more they will need to engage in the analysis I described for the glorified car radio model.

But this is only one dimension of the pressures that mobile providers of the high-speed data access model will face. There is pending legislation, intended to supplement requirements initially introduced in the DMCA to prohibit providers from giving consumers facilities that would allow them to circumvent digital rights management schemes (DRM). The proposed legislation takes the DMCA’s approach of legally aiding vendors to control how users use their digitized products by regulating technology to its next logical step, by requiring equipment to be designed according to specifications that would assure its compliance with the copyright industries’ standard for protecting their products. These standards are to be created by a body composed

of copyright industry representatives and equipment manufacturers, but if they fail to reach agreement, the law leaves it to the FCC to set these standards for how personal computers and all other electronic devices are manufactured to fit the technological protection standards of the copyright industries. Should this legislation pass, mobile wireless providers who are focusing on data delivery will likely need to design their services and their hardware to comply with standards set by the government for purposes of copy control. This may be focused on the hardware manufacturers, but may also extend to designing the transmission mechanisms so as to recognize and track permissions. It is too early to speculate on the contours of such requirements, should they pass. The basic point to understand is that the domain of paracopyrights—various statutory requirements intended to build a buffer zone around the copyright industries to protect them from the vicissitudes of digitization—can have substantial constraining effects on the design and implementation of mobile high-speed wireless data access generally.

### 2.3 But this is all the Wrong Set of Questions ...

Most of the discussion up to this point has assumed that the primary person asking the question of “what are the copyright implications of mobile wireless mass media delivery” is someone who owns a license to some form of mobile wireless service, who is attempting to move from a model of mostly voice communications and maybe SMS, to a more mass media, bandwidth hungry, high value added service. This picture is wrong in a number of fundamental ways:

The model of data delivery in the future should not be built on licensed spectrum, but on unlicensed spectrum, like WiFi networks and other equipment in the 802.11 set of standards.

There will remain room for mobile license services, but mostly in latency-sensitive services like voice and real time video conferencing, not in less latency-insensitive services of the type that can now be delivered over high speed Internet connections, even including video on demand with a short latency period for buffering.

The central value in communication is human interaction, not mass consumption of finished goods. Business models for mobile communications should focus on putting tools in the hands of individuals to talk, make their own movies, play games with others, write their own restaurant guides, give directions to others on the street next to them, and so forth, not on pushing finished cultural goods at consumers.

If true, the better business models are less concerned with mass media delivery and its copyright-based limitations, and would move away from the model of control over infrastructure and the content it delivers in two directions. First, from license-based service toward end-user equipment that enables users to make flexible uses over time, and second, into the Internet, towards businesses intended as tools for users who are not constrained by the infrastructure and the device to select from a relatively sticky set of service options, as mobile phone users are. Apple's "rip, mix, burn, it's your music" advertising campaign is a particularly crisp example of the equipment move, where the mass media content is seen as simply an input, and the value is in the manipulation capacities that the equipment provides the users. Less in-your-face models, more directly relevant to mobile wireless communications, are Intel's push to introduce a radio on a chip, which is WiFi-based, or products based on proprietary standards for communications over unlicensed frequencies, like Motorola Canopy and Nokia Rooftops. An example of a company moving from mass media deep into the Internet cloud to form tools usable by a users with any device that enables Internet access is USA Networks, which seems to be gradually migrating from being primarily a mass media provider to being a major provider of tools for users to manage their own lives from anywhere—like Expedia.com, ticketmaster.com, and citysearch.com.

In the face of the possibility of technical and business model alternatives to the model of "spectrum licensee controls infrastructure and the content on it", it becomes possible and important to consider two important problems, from the perspective of public policy, with that model. The simple problem is the effect an infrastructure-owner-controls-content model has on competition in content and services. This is a problem we know well from cable broadband, and from the emerging parallel debate about the openness of DSL. This is a problem discussed in Eli Noam's piece in this volume, to which he offers an elegant solution.

The second, more intractable, difficulty for the "spectrum licensee owns infrastructure and controls content" model is that spectrum licensing and ownership are not a desirable regulatory structure for managing wireless communications (Noam, 1998). The full exposition is too long to be given here. The encapsulated argument is that the rapidly declining cost of computation has changed the efficiencies that can be gained by bandwidth management through exclusive rights—be they licenses or property rights—as compared to unlicensed or commons-based approaches. More capacity in wireless communications networks can be gained and its growth could be faster by improving the processing capabilities of transmitters and receivers and the intelligence of wireless communications networks design than by implementing a market in spectrum licenses.



The extent to which a transmitter can reach a receiver in a way that permits the receiver to differentiate between the transmitter's signal and other sources of radiation is dependent not only on bandwidth and power, but on some combination of the bandwidth and power of the signal sent, the processing power of the receiver and the transmitter, antenna design, and the network architecture of wireless devices. When processing was expensive and receivers had to be computationally simple to be affordable, transmission power and bandwidth were the sole variables that could be used to separate signal from noise. These, in turn, were indeed the focus of licensing, and later of auctioning, and in the spectrum-property market ideal, of property rights. The drop in the price of computation, and improvements in network architecture and in the potential of cooperation among wireless devices to increase the capacity of wireless networks, have now made it possible to model and solve the problem of allowing many users in a system to communicate without a wire without relying on exclusive control of any given channel. Property rights in spectrum impose transaction costs and limit the total bandwidth usable by devices, and the flexibility with which it can be used, relative to what wideband radios and software defined radios could use efficiently. Because of the limits they place on efficient utilization of intelligent end-user equipment, property-based wireless systems will have less capacity than, and grow capacity more slowly than unlicensed- or commons-based open wireless networks.

To hitch the wagon of efficient wireless communications to the dynamics of Moore's Law and the rapid pace of improvement in computation speed and network design, it is necessary to transition most wireless communications management to equipment-based sharing protocols and away from bandwidth-management schemes. This is beginning to happen, as we see the phenomenal success of wireless LANs of various forms. We see its emergence in the FCC's approval of the U-NII Band, the UWB order, and the software defined radio order. As of this writing, the FCC is showing signs of adopting even broader spectrum commons oriented policies. If wireless networks indeed become more accessible and less licensee-controlled, then a business focus on building smart communications devices and smart services in the generally-accessible network, rather than models built on controlling the eyeball of the consumer by controlling the means for reaching it are, in the long term, more socially desirable and, quite possibly, more agile and sustainable in the face of rapidly changing technological conditions that are destabilizing the owned-spectrum model.

It is also the case that focusing on replicating the mass media model and bringing it to the 21st-century is a mistake. The mass media model is a result of the constraints of a particular capital structure of the delivery devices capable of transmitting information to large populations over a distance. From

the introduction of mechanical presses more than 150 years ago, through the introduction of movies, phonorecords, radio, television, cable systems, and satellites, the capital cost of communicating effectively has driven toward centralized, commercialized production, with stark separation between production and consumption, and large returns flowing to a small number of professional “speakers” or “performers.” Yet even in this period, people spent more on talking to each other—over the phone—than on listening to or viewing others. The dramatic decline in the cost of capital necessary to communicate effectively to large audiences over a distance, represented by the Internet, provides an opportunity to reverse the relative emphasis. It is not that mass media professionally produced commercial content will not be important. But it will be secondary to tools enabling individuals to band together in communities of interest, to communicate with each other and be users and storytellers, rather than passive consumers. The success of massive multiplayer online games like *Everquest* or *Ultima Online*; of sites like eBay; of practices like Napster, or the success of SMS, is indicative. The focus on replicating the mass media model in this environment is a mistake because that is not what people value most. It is simply what the relatively crude end-user equipment available in the past made most deliverable. The result was culturally important industries that are comparatively small to the industries devoted to giving people tools to communicate themselves.

To get the full extent of how much more people value the ability tools with which to communicate with each other than the ability passively to receive from others, all one need do is look at the 2001 Statistical Abstract of the United States.<sup>1</sup> The entire sound recording industry, one of the two primary driving forces behind the expansion of copyright, had receipts of roughly 12.25 billion-dollars in 1999.<sup>2</sup> All movie and video (53)<sup>3</sup>, all radio and television (47.6)<sup>4</sup>, all cable (60), put together with music, accounted for 170 billion dollars in receipts for 1999. By comparison, receipts from telecommunications services (319),<sup>5</sup> data and online information processing (57),<sup>6</sup> combined with only the domestic income of software (214), computer hardware (226), and communications equipment (49) yields revenues of 865 billion, more than five times as much. In other words, the industries involved in making it possible for users to make, store, and manipulate information dwarf those dedicated to vending finished information to passive consumers.

The enormous value that users place on tools for communicating, generating, and manipulating information and cultural artifacts suggests a long-term conflict between two business models with two fundamentally opposed structures of where value is, how it is maximized, and how it is appropriated.

Business models epitomized by the recording industry, the movie industry, and traditional television broadcast, focus on attracting large numbers of

people who will passively receive a stream of information or cultural goods, and consume them as and under the conditions set by the vendor. The value in that model is in the content, and specifically, in its production values. It is maximized by heavy investment in demand management and taste shaping, intended to get large audiences to fit their tastes to the output of the producer. The star and celebrity system is the central operational aspect of this strategy. Value is appropriated primarily in one of two approaches, which in some mix or another are employed by all these industries. The first is sale of the cultural products as packaged goods, with control over use of the goods so as to facilitate price discrimination. The sale as packaged goods approach is most clearly articulated in the recording industry. The price discrimination aspect is most clearly articulated in the movie release window approach. As to both aspects of this approach, control over uses that users make of the good is seen as an absolute necessity. The second approach is to broker the attention of consumers to advertisers. Television is the most obvious case of this. But obviously movies and videos all also include a component of attention brokerage, from the commercials before the movie to the product placements in them. Again, the vendors need to control how users use the goods, because they must secure their attention. The gross example is the one quoted from Jamie Kellner, head of Turner Broadcasting, claiming in an interview with *Cable World* in May 2002 that when you the consumer fail to watch the ads, “you’re actually stealing the programming.” As just noted, the total revenue of this business model in 1997 was about 170 billion dollars.

The competing business model is focused on allowing users to use the network, rather than consume finished information goods delivered over it. The computer hardware and software industries, and telecommunications services and equipment industries epitomize it. The value in these models is generated at the end points of the system. It is represented by the value to consumers of all the behaviors and interactions that the tools provided to them enable them to do over the life of the equipment of service. It is maximized by making the tools either highly versatile to allow users to re-purpose them as their needs and demand changes over time, or by optimizing the tool for a particular kind of valuable activity. It is appropriated by the provider in the price consumers pay for the tool, be it an up front payment for the equipment, which builds in the future value of use into the valuation of the equipment, or in service charges paid over time. As noted earlier, the value generated through providing users the tools they need to manipulate information and culture and communicate with each other was over five times the value generated by the other business model.

It is important to understand that these business models are not complementary, but are instead ecologically competitive. The first model needs to

constrain the set of moves consumers can make, in order to make sure that they buy their packaged goods and give them their attention. The second model needs to allow users as much freedom as possible to create, get, manipulate, and send information and culture, because this is what maximizes the users' value over time. Crisp examples of this conflict are the litigation over the introduction of the VCR, and more recently the various devices that give viewers more control over television, like TiVo or SonicBlue Replay. Apple Computers' "Rip, Mix, Burn, It's Your Music" ad was a particularly bald statement of this conflict. But the steady stream of bigger hard drives, CD burners, soundcards and speakers from the desktop and laptop manufacturers, and the improving mp3 players from mainstream companies like Microsoft and Real Networks, speak louder than any words could.

The question, seeing these facts, is why on earth anyone would want to think of mobile wireless devices as "mass media" extensions? Mobile wireless providers should be working to develop stronger business models for putting tools in the hands of users that will be most valuable to those users as tools for communication and information processing. Doing so will place mobile wireless squarely in the camp that is faster growing and higher value—the camp of the toolmakers. To adopt an approach that tries to make the mobile wireless device into a glorified car radio, on the other hand, is to choose the lower value trajectory.

### 3 The Policy Battle

I have suggested up to this point that exclusive rights in information are likely to impose a levy on service providers that try to migrate their wireless systems to a mass media model. The "mass media" approach to mobile wireless, however, should be abandoned. Mobile wireless should focus on business models oriented toward providing tools for users to make and exchange their own information and cultural expressions. It is on this model of toolmakers that companies have provided the most value to users. They have been able to appropriate it through sales of equipment and services that enable users to make and communicate their own information and culture, rather than consume ready-made culture like so much packaged cereal.

Exclusive rights are, however, also likely to pose substantial limits on what either equipment manufacturers or service providers who wish to offer high-speed access can do. Whether that will be the case, and to what extent, is still open for political battle, a battle that toolmakers have been slow to join. Because law and regulation are central pillars that enable the copyright indus-

tries' model to survive, and because of their cultural salience, the copyright industries have a tremendous power base in Congress. They have succeeded in passing quite extreme measures, like the DMCA, and quite blatant wealth transfers, like the Sonny Bono Copyright Term Extension Act of 1998, that provided a retroactive windfall extension on copyright inventories. Quite magically, the passage of these laws is rarely perceived as a partisan issue. Toolmakers, on the other hand, have been less dependent on regulation, and have been present only in telecommunications vis-à-vis sector-specific regulation, but not usually in the politics of exclusive rights. The carrier exemption from ISP liability in the DMCA is a relatively rare example where the toolmakers have been involved in, with some success, the exclusive rights legislation process.

Given the long term conflict between the toolmakers and the culture-as-goods vendors and attention brokers, the failure of the toolmakers to be present when the institutional and legal terms of this battle are being set in Congress is a strategic error. Toolmakers—computer hardware and software manufacturers and service providers, and telecommunications carriers and equipment manufacturers—must understand that the institutional ecology that sets the parameters for how valuable their tools and services could be is being set in the exclusive rights legislation arena. These businesses have a long-term interest in securing as robust a system of free information and cultural use and exchange. That is the way to maximize the value of machines and communications to users. And it is that value that users end up being willing to pay for to those who build the tools and services that make them possible.

## Endnotes

- <sup>1</sup> U.S. Census Bureau, Statistical Abstract of the United States, Section 24, Information and Communications (2001).
- <sup>2</sup> Table No. 1120, NAICS 5122.
- <sup>3</sup> Table No. 1120, NAICS 5121
- <sup>4</sup> Table No. 1120, NAICS 5131.
- <sup>5</sup> Table No. 1120, NAICS 5133.
- <sup>6</sup> Table No. 1120, NAICS 51514191, and 5142.
- <sup>7</sup> Following numbers all from Table No. 1122.

## References

- Benkler, Y. (1998). Overcoming agoraphobia: Building the commons of the digitally networked environment. *11 Harv. J. L. & Tech* 287.
- (2001). Siren songs and Amish children: Autonomy, information, and law, *76 N.Y.U. L. Rev.* 23.
  - (2002). Some economics of wireless communication. *15 Harv. J. L. & Tech.*
  - (2004). Peer production of survivable critical infrastructures. Presented at TPRC 2004, retrieved from the World Wide Web: <http://web.si.umich.edu/tprc/papers/2004/340/Benkler%20Critical%20Infrastructures.pdf>.
- Litman, J. (1987). Copyright, compromise, and legislative history. *72 Cornell L. Rev.* 857.
- Noam, E. M. (1998). Spectrum auctions: yesterday's heresy, today's orthodoxy, tomorrow's anachronism. Taking the next step to open spectrum access. *In Journal of Law and Economics* 56(2), 765-790.
- United States Census Bureau. (2001). Statistical abstract of the United States.
- Werbach, K. (2001, November). Open spectrum: The paradise of the commons. *Release 1.0.*