DIGTITAL WARS:

Legal Battles and Economic Bottlenecks in the Information Industry

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Introduction

Information is born free but is everywhere in chains.

Well, not quite. We are awash in information; lots of it is free; no one is breaking out the guillotines.

Still, the digital revolution has produced a startling anomaly. Though information of all sorts is now very cheap to create and near costless to share, the Information Industry itself is condensing into mega-empires and has ignited a series of mammoth legal battles:[1]

- Microsoft continues to own desktop computing, a nearly 20 year dominance, and its monopoly power continues to spread hither and yon – outward to desk top applications, corporate servers and databases, web servers and browsers and media players, Internet interoperability standards, PDA's, cell phones, video games, etc.

- The old Ma Bell empire, dispersed 20 years ago, is reforming around the duopoly of SBC and Verizon, and the US cell phone industry is similarly consolidating to a few mega-players.

- Once-independent cable systems companies are consolidating into a national duopoly of Comcast and Time Warner, and satellite TV is now a Direct TV/Newscorp v. Echostar duopoly.

- TV programming channels and media content generally are increasingly dominated by huge corporate conglomerates, e.g. GE/NBC/Universal, Disney/ABC, Viacom, Newscorp, and Time Warner.

[1] Aside from the general business media, no single periodical or website seeks to cover the business of the entire Industry. Its broad segments are regularly surveyed by such publications as: Infoworld, Computerworld, and e-Week magazines (computer hardware and software), Telecommunications magazine (telecommunications and data communications); Broadcast, Cablenews, and Multi-Channel News magazines (television); C-Net.com and Internet.com (the Internet and the World Wide Web); etc. Also, the Economist magazine publishes a quarterly review of information technology developments.

- All this imperializing activity is accompanied by fierce legal warfare:

-- The Open Source Wars, pitting free software against proprietary programs.

-- The Windows Wars, challenging Microsoft's monopoly power on antirust grounds.

-- The Mogul Wars, where giant electronic publishers battle each other and the government to amass ever-larger swaths of information content.

-- The Last Mile Wars, arraying the telecomm giants against the cable goliaths for control of broadband Internet access by households and businesses.

-- The Spam Wars, raising the fundamental question of who should own information about the identities and behavior of Internet users.

-- The Napster Wars, pitting intellectual property owners against technologies and services that enable the costless sharing of digital information.

This paper seeks to survey this varied terrain of commercial hegemony and legal turmoil by adopting a simple, gimlet-eyed point of focus. That point is a familiar proposition of normative economic theory (i.e. of "welfare economics"): an industry should so function as to contribute the greatest possible value to the general economy. In other words, the proper role of an industry is to make us all more prosperous.

By adopting this single norm, the paper deliberately sets aside many other values that typically enter the Information Industry fray, e.g. free speech, content diversity, democratic governance, privacy, the Dow Jones Average, America's geo-political interests, the current account deficit, etc. Similarly, the paper necessarily scoots along at high altitudes, ignoring the trees to limn the forest. Though the devils in the law usually lurk in its details, the paper must leave them there, unattended. The goal here is merely to provide an introductory framework for understanding the Industry's most persistent economic bottlenecks and associated legal tussles.

Part I explains the norm of economic value-added and offers a rough economic taxonomy of the Information Industry. The paper then moves on to examine the major legal battlefields, grouping these around the two broad issues of contention, i.e. property rights (Part II) and "natural monopolies" (Part III).

I. The Concepts of "Economic Value-Added" And "Information Industry"

A. Economic value-added

Economists typically break an industry into various markets, each defined by the particular product or service offered. The standard model (or graph) of a market depicts the product's price (vertical axis) against the number of units bought and sold over a defined period (horizontal axis). The model locates the "equilibrium" price/quantity point where the industry's upward sloping supply curve (which reflects the industry's marginal cost of providing the product) intersects the downward sloping demand curve (which tracks how many units all the consumers in the economy will buy at each price). The supply curve slopes up because suppliers maximize profits by pouring more resources into the market the higher is the per unit price, while the demand curve slopes down because cheapness makes the product more affordable for consumers.

The industry's "value added" is the area between the supply and demand curves, to the left of the equilibrium point. This value-added area is in turn allocated, by the respective positions and slopes of the two curves, between total supplier profits (the area below the horizontal equilibrium price line) and total consumer surplus (the area above that line).

Value-added – the sum of profits and consumer surplus – is the total contribution made to the general economy by the existence and operation of the particular industry market. Normative economics posits – reasonably – that more value-added is better than less.

The central theorem emerging from this standard model is that *competing* suppliers in a market will generate more value-added than will a monopoly supplier.[2] This is because competition forces each participating supplier to take the equilibrium price as a given, none being able alone to affect total market quantities or prices by a non-trivial amount. A monopolistic supplier, by contrast, can increase its profits by raising the market price (i.e. moving its supply curve upward to the left along the industry demand curve). This tactic shrinks the quantity offered and creates a wedge area to the left of the competitive equilibrium point. This wedge area represents the "deadweight loss" in value-added occasioned by monopoly. Industry profits rise but by less than the reduction in consumer surplus.

The standard model recommends, therefore, keeping markets competitive, chiefly by preventing suppliers from colluding with respect to prices or supply quantities.

The model is of course a heroic simplification. It assumes, for instance, that all suppliers' products are identical (except for their marginal costs of supply). In practice, suppliers

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[2] Kenneth J. Arrow and Gerard Debreu, *Existence of Equilibrium for a Competitive Economy,* 22 Econometrica 269 (1954).

usually seek to "differentiate" their offerings via branding and distinctive functions and features. (In the case of information products, differentiation is invariably present; no two poems are identical.) The result is "imperfect competition" and a range of supplier-distinct equilibrium prices; in effect, each supplier has some "monopoly power" for its distinctive product. But if there is adequately high "substitutability" among the products, from the consumers' perspective, the standard model still works, i.e. the market is still adequately definable as such.

B. The Information Industry

To apply this standard economic model to the Information Industry, we must first define that beast.

For purposes of this paper, an "information product" is any good or service designed to inform, entertain, communicate, or educate, and the Information Industry ("the Industry") includes all the supplier activities directly involved in creating, marketing, and/or distributing information products.

This definition obviously sweeps in millions of distinguishable products and markets -- including most of what are commonly labeled the media, entertainment, software, communications, and education industries. The Industry definition does exclude, however, myriad "information rich" goods and services designed to serve purposes other than informing, entertaining, communicating, or educating, e.g. smart bombs, self-regulating thermostats, transistor-stuffed cars, avionics gear, toasters that sing Jingle Bells as they burn your slice, etc.[3]

The Industry can be segmented in many ways, depending on one's purpose. For basic economic analysis, however, a simple tripartite segmentation works adequately: every person and firm on the "supplier" side of the Industry engages in one or more of three basic activities or functions – creating information products, marketing them (i.e. editing, packaging, branding, and promoting them), or distributing them from their creators or marketers to their final customers. Each of these activities has a distinct economic profile:

Creating:

Many people create information products because it's fun. We are an intellectually fecund species. We just can't help it. Throughout history, zillions of stories, bits of gossip, poems, lectures, carvings, songs, plays – and, more recently, photos, recordings, videos and software programs – have emerged without the slightest expectation of

[3] The paper's definition of information products has the consequence of bifurcating the "software" category. The definition includes software that seeks to inform, communicate, entertain, or educate, or to create, market, or distribute software products that have these purposes, but the definition excludes the "software innards" of "machines" designed for other purposes than these. This bifurcation has implications for whether software should be patentable. *See* Section II.A.3 below.

financial recompense. Patronage has often delivered great art, but so also have numberless drafty garrets, back-alleys, village greens, and hackers' bedrooms. The digital age has now substantially shrunk the mechanical costs of intellectual creation and, in the process, has greatly expanded the world-wide pool of creators. But of course some people will only sing for dinner.

Drawing a "supply curve" for the activity of information creation is tricky: a higher market price will bring in creators who will sing only for dinner, but will also raise a barrier to re-use of highly priced information by others. And all creators are "others" in this regard, because new information – new "culture" – is always built atop prior creations. This complication can be captured by two alternative supply curve shapes, neither entirely satisfactory. The first is flat at a price near zero for a very long distance out to the right, and then turns up to reflect the money-grubbing creators. The second starts at an elevated price, to reflect the money-grubbers, but then descends quite quickly into a near-zero flat line which extends for a very long way to the right. Unhappily, the two shapes will yield – in intersecting with the demand curve -- different "market equilibrium" prices, neither of which is quite right. The main lesson, however, is that any "equilibrium" price will be very low for raw creative activity. This is in fact the dirty little secret of the Information Industry: creators get a very small percentage of the Industry's revenue.[4] The "creating" function harbors few if any inherent monopoly tendencies, and because easy to enter, it is almost impossible to monopolize via collusion.

Marketing:

This is a more mundane, even tedious, set of activities – editing and packaging raw information products and branding and hawking them to potential consumers. These marketing activities could also be termed "publishing" (though stripped of the "physical distribution" activities often included in that term). Marketing's social purpose is to reduce the search costs of potential customers, i.e. to help folks swiftly and cheaply locate desired information products, and also in some circumstances to create a composite product more valuable to consumers than are its raw components (e.g. a magazine of multiple contributors or a blockbuster movie requiring the orchestration of many creators). Few people will do "marketing" for nothing. The supply curve for these activities is therefore fairly conventional, sloping smoothly upward. That is, marketing is a classic "variable cost" endeavor, with entry easy and relatively cheap. Marketing accordingly has low potential for spawning monopoly power.

[4] For newspapers and magazines, so-called "editorial" costs generally top out at 10-12% of revenue, and much of those expenses are actually "marketing" costs (i.e. repackaging and editing of raw information products). Even in "high R&D"software firms, the creation of new products rarely comes to more than 15-20% of revenue. Regarding R&D costs as a percentage of sales, *see* Raymond Wolfe (project director National Science Foundation, Division of Sciences Resources Statistics), Research and Development in Industry: 1999, NSF 02-312, Tables A-21-22 (2002).

Distributing:

This function used to require lugging things from place to place – books, stone tablets, newspapers, reels of film, phonograph records, floppy discs, etc. Distribution now occurs digitally, via either electronic (occasionally photonic) networks or so-called "platform software" which can host and deliver "applications" software and other digitized information products to users. Once the network or software platform exists, the distribution costs via digital means are trivial. But the upfront costs of building networks or software platforms, and the vulnerability of both to "network effects", results in very odd supply and demand curves for digital distribution activities. That's why the distribution function of the Industry is prone to bizarre outbreaks, and spreading epidemics, of monopoly power.

C. Value-added in the Industry

Trying to apply the standard economic model of "value added" to the digital Information Industry presents three immediate problems:

- The property dilemma:

  Unlike conventional products, digital information is costlessly sharable: if you and I synch our hard drives, I-Pods, or Ti-Vo's, each of us can fully enjoy the same digital information without detracting from the other's enjoyment. With conventional products, by contrast, if you have it, I don't, and vice versa, and so a price-mediated transaction is necessary to move the product to the user who values it most. These transactions generate value-added; they are the value-generating mechanism of the standard model. But with a digital information product, *once it exists*, the best way to maximize its value-added to the economy is to price all copies at zero. However, this eliminates any financial incentive to create the information in the first place (or to market it to potential consumers). This means that there is an open question in the value-added computation as to the "optimal" regime of property rights for information products: what regime of property rights will optimally balance the production of new information with the huge value added potential of free or cheap information? The standard economic model doesn't help much in answering this question, because the standard model *assumes* that exclusive ownership is technologically inevitable.

- The "natural monopoly" dilemma:

  Collusion among suppliers is not the only path to a lasting monopoly. In two situations, a "natural" monopoly can emerge – and both situations occur frequently in the distribution function of the Information Industry.[5] In the first -- the situation of

[5] Natural monopolies give rise to "increasing returns", an economic concept that itself did not achieve a fully rigorous scholarly examination until the mid-1990's. The seminal work is W. Brian Arthur, Increasing Returns and Path Dependence in the Economy (1994).

"extreme scale economies" -- a supplier faces very high upfront expenses – causing a very high marginal cost for the first unit of supply – but the firm then enjoys very low and often decreasing marginal costs for the subsequent units it supplies. This gives the firm a *downward* sloping supply curve after the first unit. Enjoying a *temporary* monopoly from its initial entry into the market, the first-mover firm can price the subsequent units high enough to recoup its upfront costs. Later entrants, however, will not have the monopoly power to recoup their entry costs – and so may not enter at all. The result is a durable "natural" monopoly for the first entrant. Examples include railroads. fixed line telecommunications services, and cable TV systems: the first unit's marginal cost includes massive investment in railway right-of-way and tracks, trenches, poles, wires, cables, transmitters, etc., but subsequent units of the service incur very low marginal costs.

The second "natural monopoly" situation -- so-called "network effects" -- results in an abnormal *demand* curve, i.e. one that slopes upward. This happens, for instance, with a proprietary communications service, e.g. a proprietary telephone or instant messaging network: each user will value this proprietary service at a higher price the greater is the number of other users. The initial service provider garners a natural monopoly because new users flock eagerly to where other users are accumulating. The same "network effects" phenomenon happens with platform software: the program that attracts the most third party "applications" will become more valuable per unit to its potential users, and more applications will get written for the most used platform.

Natural monopolies – whether resulting from extreme scale economies or network effects -- are not curable by forced competition, e.g. by breaking up the monopoly firm into competing units. This merely destroys the value-added generated by the extreme scale economies and/or network effects; and break-up would in any case prove only a temporary expedient, as the forces of natural monopoly would re-assert themselves, enabling one of the newly broken-up units to take over the entire market.

- Cross-market leveraging of monopoly power:

The standard model deals with a single market over a defined time period. It therefore cannot capture the phenomenon of "leveraging" monopoly power from one market into an adjacent market (e.g. a market that the monopolist buys from or sells to or that provides products complementing the monopolist's product). Leveraging could occur by acquiring a firm in the adjacent market or simply by entering it aggressively, and then tying together products from the two markets.

For many years, prevailing economic opinion held that cross-market monopoly leveraging was a rare and harmless phenomenon, because monopoly profit in the primary market is maximized by keeping adjacent markets conventionally competitive: such competition minimizes the monopolist's input costs and/or maximizes end market demand for its product. So "leveraging" merely re-allocates

the monopoly profit from the primary market into the adjacent markets and doesn't add to total profits.[6]

This logic is generally sound -- but only if the adjacent markets *can* remain competitive. If, on the other hand, these markets have strong natural monopoly characteristics, *someone* will very likely monopolize them, and it is clearly in the primary monopolist's profit-making interest to be that someone. This is doubly so if the adjacent market's product is in fast-growing demand and has the potential to obsolete totally or in part the primary monopolist's product. Leveraging then becomes necessary for long term corporate survival and is also a way to control the pace of product innovation and new market emergence. In that sense, cross-market leveraging allows the firm to retard or otherwise tame the dynamic forces of "creative destruction"[7] in a multi-market industry.[8]

All this is intensely relevant to the Information Industry, because this is an arena where natural monopoly markets abound, and where the rapid invention of new products and markets, obsoleting old ones, is itself a significant engine of competition and economic value creation.

These three "dilemmas" do not make the norm of "economic value added" less persuasive, but they do mean that merely preventing collusion among suppliers is insufficient to optimize Industry value-added. Doing so also requires "optimal" property rules and sound government policies regarding natural monopolies and the cross-market leveraging of natural monopoly power. Not coincidentally, it is in precisely these two areas that the Industry's major legal wars are being waged.

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[6] A good summary of this view is Robert Bork, The Antitrust Paradox: a policy at war with itself 225-245 (rev. ed. 1993). *See also* Ward Bowman, *Tying Arrangements and the Leverage Problem,* 67 Yale L.J. 19 (1957), Robert Bork, *The Rule of Reason and the Per Se Concept: price fixing and market division (part 2),* 75 Yale L.J. 373 (1966), and Richard Posner, *The Rule of Reason and the Economic Approach: reflections on the Sylvania decision,* 45 U.Chi. L. Rev. 1 (1977).

[7] This term was coined in 1942 – well before the Digital Revolution -- by the Harvard political economist Joseph A. Schumpeter, Capitalism, Socialism and Democracy, 82-85 (3rd.ed. 1975).

[8] These issues are treated in depth in Jay P. Choi and Chris Stefandis, *Tying, Investment, and Dynamic Leverage Theory, 32:1* Rand J.Econ. 52-71 (2001). Dennis Carlton and Michael Waldman, *The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries,* NBER Working Papers No. 6831 (2000). *See generally:* M.A. Lemley and D. McGowan, *Legal Implications of Network Economic Effects,* 86 Calif. L.Rev. 479 (1998); M.L. Katz and C. Shapiro, *Network Externalities, Competition, and Compatibility,* 75 Amer.Econ.Rev. 424 (1985); Richard Schmalensee, *Antitrust Laws in Schumpeterian Industries,* 90:2 Amer.Econ.Rev. 192 (2000).

II. The Property Wars

To create a property right in a digital information product requires either a legislated regime of intellectual property protection, capable in enforcement of foiling free copying, or a technology that makes possible the exclusive ("physical") possession of information products. The chief forms of legislated intellectual property are copyright and patents, while the technology promising exclusive possession is called "digital rights management" ("DRM").

A. Copyrights and patents

A legislated property right requires specifying three variables: the right's trigger event, its duration, and its scope. Copyright and patent laws have spawned enormous controversies by their recent treatment of each of these variables.

In U.S. law, economic value-added is the correct criterion for testing various specifications. Though continental European law recognizes for creators an inalienable "natural right" to property in intellectual and artistic products, the American Constitution regards information as unowned absent positive law to the contrary. The Constitution vests exclusively in the Congress the power to create and recognize intellectual property rights for the sole purpose of "promot[ing] the progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective writings and discoveries".[9] But of course, the document does not detail how to craft the three variables of those property rights, and therein lies the rub.

1. Copyright[10]

Before 1976, the trigger event for copyright protection was the creator's formal "registration" of her claim with the U.S. Copyright Office. This served to winnow out myriad information products whose creators didn't care enough about financial reward to bother with the registration formalities, and it also gave other creators a handy place to check on whether information they thought about using or re-working was legally protected. Today, however, copyright protection arises automatically upon the mere

[9] U.S. Constitution, Art.I, Sec.8, Cl.8.

[10] For a good summary of copyright law doctrines, *see* Arthur R. Miller & Michael H. Davis, Intellectual Property 295-406 (3rd edition, 2000).

creation of an information product. No registration or other public disclosure is required unless and until the claimant wishes to assert the claim. This simple change in trigger has extended copyright all over the landscape; one must now prudently assume that every shred of information is legally protected, and there is in any case no way to find out one way or the other.[11]

This change in trigger didn't serve the norm of value-added. New information, of any type or genre, builds on old information. To throw an automatic "don't use or copy this" ban across all fragments of new information in a society does not plausibly optimize the creation of new information. It retards it by generating needless uncertainty in tomorrow's creators.

The duration of copyright has also greatly expanded since the Nation's first copyright statute.[12] The original protection lasted 14 years (with one 14 year renewal possible through re-registration). Today, after several dramatic congressional extensions, copyrights last 70 years after the author dies. Like the liberalization of the trigger event, this longer duration radically reduced the public domain without adding plausibly to a new creator's incentive to create. How many creators would really decide to down tools if their potential royalty period were 28 rather than 75 years?

However, the weirdest deformities of modern copyright law concern the "scope" of protection, the third variable of a property right.

- The first copyright statute covered words, in effect (given the technology of that era) books, magazines, and newspapers. Today the protection extends to all information products – songs, recordings, cartoons, photographs, paintings, plays, musical and stage performances, statues, sound recordings, movies and videos, and software programs – in a phrase, nearly everything in the culture. Though one can certainly argue that each of these things needs some sort of ownership right, the statutes make few distinctions concerning the kind of legal protection these diverse artifacts should enjoy.

- For conventional products, ownership of something is naturally delimited by the physical dimensions of the thing. Copyright protection, by contrast, extends to "derivatives" of the protected information. Since all new information necessarily builds upon prior information, the "derivative" concept is a dark cave in which many devils may lurk. Modern case law has dramatically extended the derivative notion, without clarifying it, and has thus cast inevitable uncertainty around every

[11] Larry Lessig, *The People Own Ideas*, Technology Review (MIT), June 2005, p. 49.

[12] Congress has legislated 11 retroactive extensions of copyright's term in the last 40 years, versus just two in the Republic's first 150 years. Larry Lessig, The Future of Ideas (2001), p. 107. The most recent retroactive extension was unsuccessfully challenged on constitutional grounds, Eldred v. Ashcroft, 537 U.S. 186 (2003). Justice Breyer's dissent in that case analyzed the economic illogic of retroactive extensions of copyright terms.

work that in some way echoes or is inspired by or makes reference to an earlier work.

- There now exist – thanks to the meandering course of case law -- three varieties of "secondary" liability for copyright infringement -- contributory, vicarious, and induced infringement. Not even the most expert intellectual property lawyer can reliably tell you what each means or how they differ from each other. This is particularly troublesome in the digital age because of the possibility that supplying a use-neutral technology or technology-based service might give rise to a secondary liability finding under one or more of these theories. Until this year, it was reasonably clear that a use-neutral technology or service would escape such liability, even if used after sale to infringe copyrights, as long as the technology or service also had "substantial non-infringing uses". In *MGM v. Grokster*, the Supreme Court reiterated this principle but held that copyright inducement could nonetheless attach to a use-neutral file sharing service if its supplier actively sought out infringing customers and – perhaps most significantly -- that failure to take simple steps to block such infringements can serve as confirmatory evidence of an intent to induce infringement.[13] What legal risks this decision now poses for technology innovators, no one is sure. The only certain thing is that there will be lots more expensive litigation – imposing in effect a new "risk tax" on technological innovation.

- The two doctrines designed to limit the scope of copyright protection – the "idea/expression" distinction and the "fair use" defense – are vague and continuously mutable in their judicial interpretations, spawning endless litigation, which inevitably turns on an uncertain "balancing" of "multiple factors" that vary with the "facts and circumstances" of each case. This kind of judging may look "judicious" to lawyers, and it undeniably keeps them profitably engaged. But for litigants – for the people actually trying to function in the Industry – it is a long-winded way of saying that there is, effectively, no reliably knowable law here.

- The application of copyright to software, accomplished by statute in 1980, is especially vexing. This is in part because software, even more than other information products, necessarily builds upon prior software: there are only so many "good" ways to program particular ideas and desired effects, and software programs must generally co-exist and co-operate with software products already lodged on users' computers. So the copyright distinction between ideas and expressions and the copyright concept of "derivatives" can be particularly mischievous in the software field. There is also no sense in granting a long duration to software copyrights, because the commercial life of a typical software product is 1-3 years. The coverage of software is also problematic because software programs are created in five distinguishable stages, and the law is

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[13]MGM v. Grokster, 545 U.S. ____(June 26, 2005). The prior Supreme Court precedent on copyright liability for use-neutral technology was Sony Corp. v. Universal City Studios, 464 U.S. 417 (1984). *Grokster* involved a peer-to-peer file sharing technology service; *Sony* involved the VCR.

unclear what manifestations of which of these stages is in fact copyrightable. The first stage is the "functional specification", which is typically a mere wish list of things some manager or entrepreneur would like to see the software accomplish for its customers. The second stage, the "technical specification", is a programmer's roadmap for building the software. The third stage, the "source code", specifies the program in a "high level" language (e.g. Java, C++, Basic) readable by other programmers. The fourth stage, "object code", consists of lots of "1's" and "0's" that are readable only by a computer operating system, which then follows these digital instructions in telling the machine what to do. Object code is what the firm sells or licenses to users. (The firm generally keeps the source code a dark secret, files away the technical specification, and largely forgets the functional specification.) The fifth stage is the "look and feel" of the program on a user's computer monitor. Which of these five things is covered by a copyright on the "program", and to what extent, is left by copyright law to case-by-case adjudication and the gradual accumulation of inevitably inconsistent precedents grounded in facts and circumstances that are of course never exactly duplicated. The result is a legal regime that shrouds the entire software industry in uncertainty.[14]

- Through a 1909 quirk in legislative draftsmanship, copyright today protects against "copying" rather than, as originally intended, against "publishing".[15] In the printing press age, the two were roughly identical. In the digital age, however, every *viewing* of a piece of information – every repeated "use" of it by a computer – generates a fresh copy of the thing. View a thing twice on the monitor, or save it to memory, and you are violating the copyright, unless specifically licensed for these multiple copies. This infelicity in copyright's formulation is, again, particularly anomalous for software products. It is standard practice in the industry to run an old program's object code multiple times in order to discern the logic of its source code, and so discover how it does what it does. This "re-engineering" process is necessary in order to build new programs that do things better than old ones. Because it entails repeated "copying", the re-engineering process is technically a violation of the old program's copyright. The courts have – so far – exempted re-engineering from copyright liability, but this exemption is not embedded in statute and is accordingly subject to the shifting tides of judicial opinion.[16]

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[14] *See* Micro Star v. Formgen Inc., 154 F.3d 1107 (9th Cir. 1998); Lotus Corp. v. Borland International, Inc., 49 F3d 807 (1st Cir. 1995), *affirmed* 516 U.S. 233 (1996); Apple Computer Inc. v. Microsoft Corp. 35 F.3d. 1435 (9th Cir. 1994), *cert. denied* 513 U.S. 1184 (1995); Johnson Controls, Inc. v. Phoenix Control Systems, Inc. 886 F.2d 1173 (9th Cir. 1989). *See generally:* Siva Vaidhyanathan, Copyrights and Copywrongs 112-114 (2001), and Alfred Yen, *A First Amendment Perspective on the Idea/Expression Dichotomy and Copyright in a Work's "Total Concept and Feel",* Emory L.J. (1989), at 404-406.

[15] Lessig, supra note 11, at 49.

[16] *See* Sony Computer Entertainment, Inc. v. Connectix Corp., Sony Computer 203 F.3d 596 (9th Circ. 2000). *See also* Sega Enterprises Ltd. v. Accolade, Inc., 977 F.2d 1510 (1992). For an argument that reverse engineering should not be liberally allowed under copyright law, *see* J. Vining, *The Future of*

For all these reasons, contemporary copyright law fails to optimize the economic value-added by the Information Industry. The remedies are obvious, though politically unrealistic at this point: re-instate official registration as copyright's trigger event, shorten the length of protection (particularly for software products), narrow the definition of "derivative" products, embed in statutory law the exemption for the software re-engineering process, erase secondary infringement liability for use-neutral technologies and technology services, sharpen the vital idea v. expression distinction, and expand and clarify the standards for fair use of copyrighted material.

2. "Copyleft"[17]

The overreach of copyright doctrines has spawned a very clever contractual innovation that turns copyright law upside down. Available in several variants, an "open source" copyright license – also called a "copyleft" license -- essentially permits a creator to assure that her work – and all its future derivatives (by anyone) – will remain freely and permanently available in the public domain.

Open source licenses have spread rapidly throughout the software industry, giving birth – through unpaid cooperative efforts that span the globe -- to such products as the Linux operating system, the Apache web server, the Firefox web browser, and many important software components of the public Internet. Linux is seriously challenging Microsoft Windows in the corporate server market; Apache has long been the market-leading web server; and Firefox is gaining market share (albeit from a small base level) from Microsoft's Internet Explorer browser. Sun Microsystems has recently released its Solaris operating system and some of its Java technology under specialized open source licenses. Linux is championed by large technology vendors, such as IBM and Hewlett Packard, which have committed large sums to its marketing and technical support.

The open source model is also now being tried in non-software markets, e.g. for music, videos, and books. Particularly in underdeveloped economies, there is clearly widespread enthusiasm for this vision of "free culture".

Computer Software in the Reverse Engineering War: Excessive Protection v. Innovation, 67 Brooklyn L.Rev. 567 (2001).

[17] For a history of the open source movement, *see* Glyn Moody, Rebel Code: Linux and the Open Source Revolution (2001). On the General Public License, the most popular "copyleft" license, *see* David McGowan, *Legal Implications of Open Source Software,* 2001:1 Univ. Ill. L. Rev. 241 (2001).

The aim of the open source movement is to create a large storehouse of information products that everyone can freely use, adapt, customize, and improve (with all changes also entering the copyleft domain). Doubts certainly remain whether this model of collaborative, financially uncompensated creative effort can create products of the highest quality and sophistication. But it is difficult to disparage such early successes as Linux, Apache, and Firefox on those grounds. The copyleft movement in effect trades away financial reward for the convenience and cheapness of re-using old information – and this plainly results in more value-added in some important real world contexts.

3. Software Patents[18]

Most information products (e.g. stories, poems, songs, videos, etc.) cannot be patented. Patent law aims to protect (with a 20 year monopoly) inventions that are novel, useful, and non-obvious to people reasonably experienced in the particular trade or profession.

But software *can* be patented. Until 15 years ago, this was not so, because software programs were judicially regarded as collections of "if/then" algorithms – in effect as "mathematics" – and mathematical formulas and equations cannot be patented. The legal logic of the courts' self-reversal need not detain us. Some sort of reversal was no doubt inevitable, and economically justified, because "machines" of all types today use chips and software to replace what were once levers, cogs, ratchets, and wheels. So inventing a new, useful, non-obvious "machine" is today often in part a software programming exercise. However, the courts did not stop there; they deemed *all* software programs eligible for patent applications, i.e. including those stand-alone programs which this paper includes within the Information Industry. So now you can patent programs designed to inform, entertain, communicate, or educate or that create or host products that do these things. At the same time, the courts declared that mere "business processes" and "business methods" are also patentable (e.g. Amazon's "one click ordering" idea for online commerce).[19]

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[18] For a good summary of contemporary patent law doctrines, *see* Miller & Davis, *supra* note 10, pp. 4-154. Recent judicial expansions of these doctrines are reviewed critically in Fred Warshofsky, The Patent Wars (1994).

[19] Software's patentability was established in State Street Bank & Trust v. Signature Financial Group, 149 F.3d 1368 (Fed. Cir. 1998), *cert. denied* 525 U.S. 1093 (1999). The earlier view, that software was not patentable because it consisted merely of mathematical algorithms, was stated in Gottshalk v. Benson, 409 U.S. 63 (1972). The courts briefly seemed ready to distinguish the software components of machines, which would be patentable, from standalone software, Diamond v. Diehr, 450 U.S. 175 (1981). But the law ultimately took a maximalist position. State Street Bank & Trust v. Signature Financial Group, at 1373. Regarding the patentability of business methods and processes, *see* Rochelle Cooper Dreyfuss, *State Street or Easy Street: Is Patenting Business Methods Good for Business?*, 6 U.S. Int. Property: Law & Policy 277 (2000).

This makes no economic sense.

- Software already enjoys copyright protection. Adding another layer of intellectual property is at best redundant. Copyright and patent doctrines are confusingly inconsistent: (i) Patent protection imperially reaches out to cover all the five stages of software production, but how and why are unclear. For instance, software firms routinely claim patents on their "source code", even though – under standard patent doctrine – anything patented must be disclosed to the public, and source code is rarely disclosed. (ii) The idea/expression distinction that limits copyright's scope has no place in patent law: ideas are patentable. That's presumably why business methods and processes (and, one expects, "functional" and "technical" specifications for software programs)are now patentable. (iii.) Patent law recognizes no "fair use" defense to infringement. (iv.) Both copyright and patent law cover "derivatives" of the protected product, but the derivative doctrines are different under the two bodies of law.[20] In consequence, the double intellectual property protection of software adds many layers of uncertainty for any innovator sitting down to write a new program that may echo in some way the logic or purposes, or even the conceptual ideas, of existing programs.

- Compared to copyright litigation (which is itself costly and time consuming), patent suits are phenomenally expensive, lengthy, and uncertain in result.[21] Big firms can afford this burden, and can additionally afford to amass a sufficient portfolio of patents to counterattack any small or start-up firm that may choose to bring a patent infringement suit. Though ostensibly designed to protect the maverick entrepreneur and innovator, patent law in its litigation economics tilts the odds heavily in favor of large, entrenched firms. Since many of the major innovations in the Information Industry have historically emerged out of small, start-up companies, this is no trivial problem.

- The Patent Office is notoriously ill-equipped to understand or vet the myriad, exotic software and business process/method patent applications that stream

[20] See J.H. Reichman, *Legal Hybrids Between the Patent and Copyright Paradigms,* 94 Columbia.L.Rev. 2432 (1994).

[21] The average cost of a patent suit was estimated at $1.5 million per party 4 years ago. Ian Mount, *Would You Buy a Patent License From This Man?,* eCompany (April 2001). One expects the tab has only increased since then.

in regularly from the Information Industry. Therefore thousands of such patents have been issued. Though many – perhaps most -- would prove invalid in litigation (because of lack of novelty, utility, or non-obviousness), the costs of litigation are so high that these roguish patents nonetheless often cow innovators into settling court challenges for large sums or, more often, into simply giving up on innovating in a field that shows lots of issued patents.

- Nearly all commercial innovation in software and business methods takes place to keep up with intense marketplace competition. The firm innovates because its survival and prosperity require it. In most cases, this sheer race for survival and fleeting competitive advantage provides more than enough "incentive" to innovate: slapping on a 20 year legal monopoly is not needed for these innovations to emerge. The monopoly protection amounts to severe overkill, and serves only to discourage subsequent innovation. With software and business processes and methods, we are not dealing with the lone visionary who must spend years in his garage or basement to come up with a totally revolutionary new technology, or with a firm that needs millions of dollars and many years to bring a new drug from conception to marketability. We are instead dealing with a near continuous process of innovative improvements upon prior software programs and prior business models. Patent law is simply not needed in this environment. The software industry, and business models throughout the Information Industry, witnessed extremely rapid innovation for many years before the courts decided to recognize the patentability of such innovations.

- The patentability of software throws into question the viability of the entire "copyleft" movement. Open source programs combine and mix the accretive work of many programmers and can easily end up incorporating some scraps of code against which some company could claim patent infringement and demand royalties. But a copyleft license generally prohibits paying royalties. This puts the user of the open source software into a legal Catch 22. For instance, Microsoft's vast patent portfolio likely contains some claims – merited or not -- that could plausibly be lodged against the Linux open source operating system. Apparently, Microsoft has not yet used patent infringement threats in its market share struggle against Linux, but that possibility has already caused consternation in companies now deploying Linux.

The obvious remedy for all this silliness is to exclude stand-alone (or, if you prefer, "Information Industry") software (and business methods and processes) from patentability. This would still leave patentable the "software innards" of conventional, machine-like inventions. Though such a solution would obviously require some case-by-

case line drawing, the notion is hardly novel or impractical: the European Union is currently debating similar schemes.[22]

B. Digital Rights Management[23]

Just as digital technology enables the costless sharing of information products, it now also can enable exclusionary control over such products. So-called "digital rights management" ("DRM") technology now coming to market permits the creator, marketer, or distributor of a digital information product to dictate precisely who may use or otherwise experience, copy, and/or further distribute the product and on precisely what financial or other terms and conditions. These limitations are built into the products themselves: violating the limitations disables the products.

DRM creates a "property right" rooted in first physical possession rather than in legislation. And this property right is considerably more detailed and exact than is true even for conventional tangible products. With a conventional product, you typically sell it or lease it on reasonably simple terms, and that's that. The buyer of a sold good can then do anything she wants with it. A lessee is bound by the lease terms, but these are rarely very detailed. DRM, however, enables an information product creator to break the product into many possible uses or usage scenarios, each with distinct terms and conditions.

DRM recognizes none of the "duration" or "scope" limitations of copyright, permitting for instance the "ownership" of ideas, not just expressions, and requiring no accommodation for "fair use". For these reasons, advocates of the public domain generally find DRM technology objectionable and frightening.

But, compared to modern copyright law, DRM does require the non-trivial "trigger event" of setting up, technologically protecting, and making crystal clear the terms and conditions of use and distribution. Also, DRM does not cover "derivatives" of the product. And the "detailed" character of DRM permits very fine-grade pricing of various usage and distribution scenarios. These features all arguably make DRM a spur to value-added in the Industry.

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[22] The EU Parliament recently rejected an EU Commission proposal to make the softward innards of machines patentable, leaving software patent law for now as a national issue; no EU nation currently recognizes software patents. See, e.g. BBC new article, July 6, 2005, at http://news.bbc.co.uk/2/hi/technology. In the U.S., there is of course little prospect that Congress or the courts will totally reverse course on the patentability of stand-alone software programs. But there is considerable room for improvement in judicial interpretation of various patent doctrines in software cases. *See* Julia E. Cohen & mark A. Lemley, *Patent Scope and Innovation in the Software Industry,* 89 Calif. L. Rev. 1 (2001).

[23] For an interesting economic analysis of DRM, see Michael A. Einhorn & Bill Rosenblatt, *Peer-to-Peer Networking and Digital Rights Management*, Policy Analysis (CATO Institute), No. 534, Feb. 17, 2005.

Few DRM opponents would outlaw the technology. Rather the battles underway center on laws that criminalize technological "circumvention" of DRM systems.[24] The argument against anti-circumvention statutes is that the government should not (and arguably may not, under the Constitution) protect technology that in effect creates intellectual property rights beyond the limits of conventional intellectual property law.

It is very difficult to say whether DRM or conventional intellectual property law better serves the norm of value-added. DRM re-erects the classical model of a standard competitive marketplace, mediated by clearly understood transactions. How economic value is created in that model is plain and well understood. Also, because it requires a technological "trigger event" and does not cover "derivatives", a DRM-only world would likely have a large and clearly demarcated public domain. On the other hand, within the "private" DRM domain, there would be no free sharing of information, with a commensurate loss of value. All that is clear, I think, is that we don't want what we most likely will get – a world in which *both* DRM technology *and* the overreach of conventional intellectual property rights co-exist, confusing everyone and generating years of costly litigation. Here's a politically impossible but economically provocative idea: Congress should consider outlawing DRM-circumvention only in cases where the DRM-deployer has expressly waived all of her conventional intellectual property rights!

C. Spam and Spyware:

Digital technology and the Internet have together made feasible "person-to-person" marketing – the detailed sculpting of products and advertisements to the particulars of each potential customer.[25]

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[24] The most prominent anti-circumvention law is The Digital Millennium Copyright Act [DCMA], 17 U.S.C. sec. 1201(a)(2). *See generally:* David Nimmer, *A Riff on Fair Use in the Digital Millennium Copyright Act,* 148 U.Pa.L.Rev. 673 (2003); *Symposium, Exploring Emerging Issues: New Intellectual Property, Information Technology and Security in Borderless Commerce: The Anti-Circumvention Provision of the DMCA,* 8 Tex.Wesleyan L.Rev. 593 (2002). Initial court decisions under the DMCA have rejected constitutional objections to the Act's anti-circumvention provisions (e.g. objections that allege such provisions intrude on First Amendment rights or transcend Congress' power to legislate protection of intellectual property): Universal City Studios, Inc. v Corley, 273 F.3d 429 (2d. Cir. 2001); U.S. v. Elcom, 203 F.Supp.2d 1111, 1138-41 (N.D. Calif. 2002). The DCMA does direct the Librarian of Congress to conduct a review every three years of the Act's effects and authorizes the Registrar of Copyrights to exempt from the Act whole classes of works on which the Act may be foreclosing use that is not an infringement of copyright law. DCMA *supra* at sec. 1201(a)(1)(b) and (c). But the first such review resulted in no exemptions. Copyright Office, *Exemption to Prohibition on Circumvention of Copyright Protection Systems for Access Control Technologies; Final Rule,* 37 C.F.R. Part 201, 65 Fed. Reg. 64556-01. *See also* Nimmer *supra* at 693. Similarly, the courts have permitted license terms embedded in so called "shrink wrap licenses" to go beyond the intellectual property protection provided by traditional copyright law. Pro CD, Inc. v. Zeidenberg, 86 F.3d. 1447 (7th Cir. 1996).

[25] *See generally* D. Peppers & M. Rogers, The One to One Future (1996), and P.B. Evans & T.S. Wurster, *The Strategy and the New Economics of Information*, HBR: September/October 1997.

Users of online services – email, websites, online commerce services, etc. – automatically generate lots of information about themselves: email addresses, the sites and subjects they consult on the Web, the stuff they buy or consider online, the things they talk about in their emails or instant messages, etc. Digital technology permits those on the other end of the line, and often third parties who scan and crawl about the Internet, to discover, amass, and correlate this information. The results are then used by both "legitimate" commercial firms and assorted rogues and hackers to access the users who generated it, usually to advertise or offer products to them. The result is convenience for Internet users -- but also email "spam" and various sorts of spyware and adware that get stealthily implanted on the user's computer.

In sorting out the rights and wrongs of all this, judges and legislators have typically resorted to rough analogies with "off-line" commerce and to tangentially relevant legal doctrines such as free speech, copyright law, trespass on choses, and various privacy concepts. But, to analyze the economics of alternative solutions, and also to impose some coherence on the law across this whole area, the basic normative question is "who should 'own' user information?"

There are two conceivable answers: the users themselves or those who amass and compile the information (which is, at least initially, the provider of the online service or of sub-services riding atop the primary service).

The information is obviously very valuable: that's why it gets commercially used, rented, and abused so lavishly. (The going rate for a single use of a person's email address is about 40 cents.) But that value accrues in two distinct stages, first at the generation of information by each user, and then by the compilation and cross-indexing of the raw information across a number of users. One could tarry here to consider whether assigning property rights to users or to the information-gatherers would minimize "transaction costs", but this isn't necessary: transactions in cyberspace are very cheap.

The value maximizing solution is to vest ownership in the person about whom the raw information pertains.[26] In other words, you should own who you are and what you do in cyberspace. This solution would accurately capture both sources of value creation in its pricing schema. The online service would "pay" for the user's raw information – in cash or kind – and would then make a profit over that cost to the extent compiling and correlating multi-user information created value in the marketplace.

And indeed most legislation regarding customer data, spam and spyware does now give a central role to user "permission", which is the practical vehicle for creating a transaction between the user and the information compiler. The differences among the various statutes and legislative proposals center on the exact type of user permission that is

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[26] *See* I. Ayres & M. Funk, *Marketing Privacy*, 2 Yale J. Reg. 77 (Winter 2003).

required. That's because there is in practice an enormous behavioral difference between explicitly saying OK and simply neglecting to "opt out" of an otherwise automatic transfer of ownership. (In short, the legal devil here lurks in the so-called "default option".) Needless to say, companies in the business of compiling multi-user data prefer the weakest conceivable permission requirement, as this artificially reduces their cost of goods sold; but that is not a sound argument from the point of view of total economic value-added.

The really hard public policy work still to be done concerns practical issues regarding enforcement of the user ownership right. The difficulties are of several types -- technical obstacles to finding the violators (because the underlying protocols of the Internet permit great anonymity) and problems in fashioning international rules for enforcing workable civil and/or criminal remedies. Still, all this work would be facilitated by a clear and uniform recognition of property rights to customer data.

III. The Monopoly Wars

The distribution function in the digital Industry is rarely "competitive" in the normal sense. That's because digital distribution is highly vulnerable to the two forces of "natural monopoly", i.e. extreme scale economies and network effects. These forces have created major economic bottlenecks and associated legal battles in two large sectors of distribution -- platform software and electronic networks.

A. Platform Software

Software becomes a "platform" – and therefore a vehicle for distributing information – by hosting other software. A computer operating system is the classic case. Though its main purpose is to control the innards of a computer system, an operating system hosts application software by providing an "application program interface" ("API").

As everyone knows, and US and EU courts now recognize,[27] Microsoft's Windows enjoys a monopoly in the market for client computer operating systems. How Microsoft got that monopoly is interesting but secondary from an economic point of view (and also not the focus of current litigation). The economic reality is that *some company* was inevitably going to monopolize that market. That's not because operating systems require

[27] U.S. v. Microsoft, 253 F.3d 34 (2001). Regarding the EU case, *see* the EU Commission Decision, March 24, 2004 (Case COMP/C-3/27.792 Microsoft).

huge upfront costs, creating extreme scale monopolies; Microsoft in fact bought its initial product in this market for all of $50,000. Rather, the market monopoly was created by the *proprietary capture of "network effects".* The network effects themselves are simple and powerful: application software will get written first and most for the operating system with the biggest market share, and operating system buyers will gravitate to the system with the most applications. But network effects can generate private monopoly only when there is no uniform, "open" standard in the market for the API. With an "open" API, every application would work on all competing operating systems; these systems would then need to compete "normally", i.e. on their respective technical merits in controlling the innards of computer systems. Monopoly was inevitable in the Windows market because that market lacked (and still lacks) an accepted "open" (i.e. accepted "industry standard") API.

More generally, the entire platform software industry spawns monopoly power because it has so few "open" interoperability standards.

This monopoly power is doubly erosive of value-added. First, it directly elevates the price and reduces the units sold in each affected platform software market. That's why Windows still costs about what it did originally, while every other component in a PC has declined significantly in price. Second, platform software monopolies permit their owners to "leverage" their monopoly power into adjacent markets, e.g. markets for "office" applications, corporate servers and database platforms, web browsers and media players, PDA and cell phone operating systems, and Internet operability standards.

The tactics used in such leveraging have been varied, but the most potent ones have involved selective disclosure or manipulation of the proprietary Windows API. The most extreme leveraging tactic has been simply "incorporating" Microsoft's adjacent market product into Windows itself, as a new "technical feature".

This cross-market leveraging works, i.e. is profit-protecting and profit-expanding for Microsoft, because these adjacent markets themselves have strong natural monopoly characteristics, lack "open" API's, and have considerable potential to become high-growth substitutes for the application hosting capabilities of Windows itself. Therefore leveraging is a way both to defend and to extend Microsoft's monopoly power.[28]

It is this leveraging, not the Windows monopoly itself, that have animated the recent US and EU antitrust prosecutions of Microsoft.[29] The US case dealt with the Company's attack on the Web browser market, while the EU case has considered a wider range of adjacent markets. The EU case drags on, but the European Commission does appear to have wrestled directly with the economic realities of monopoly leveraging. The US case

[28] Regarding Microsoft's overall business strategy of monopoly leveraging, *see generally* David Bank, Breaking Windows (2001).

[29] *Supra* note 27.

is largely over (though with continued federal court monitoring of the consent decree agreed between Microsoft and the Justice Department and with follow-on private antitrust cases now moving toward final settlement). But the final U.S. appellate opinion betrayed considerable hesitation in facing the leveraging phenomenon full on. The Court affirmed that leveraging can constitute an illegal "defense" of an existing monopoly but refused, on the evidence developed at trial, to hold that this same leveraging constitutes an illegal attempt to monopolize the target market.[30] One suspects the Court felt restrained by the doctrinal muddle that has surrounded the leveraging phenomenon in American scholarly and judicial writings for a number of years.

There remains, on both sides of the Atlantic, considerable doubt that antitrust courts have the tools necessary to remedy monopoly leveraging. The US consent decree and the EU tentative judgment both seek to insulate Windows' adjacent markets from leveraging by forcing the Company to make its API standards more "open", in hopes that Microsoft's adjacent market products won't then enjoy an unfair advantage over competitors. But this approach to remedies is replete with problems. First, Microsoft never tires of characterizing this forced "openness" as a theft of its intellectual property. This is a spurious argument, because adverse judgments typically require property forfeiture in all areas of law, but also because affording intellectual property rights to the API's of monopoly software platforms makes no economic sense. (API's are little strings of mundane code, requiring no great inventive genius.) Second, the judiciary is plainly unsuited to the very detailed, long term, technical monitoring necessary to assure that an API remains adequately open. Finally, of course, the sheer duration of antitrust litigation means that none of the markets initially at stake in the US and EU cases remains fully competitive; past leveraging has permitted Microsoft to seize its critical competitive edge in each one.

The US trial court had imposed a remedy that would largely overcome these problems: forced divestiture of Microsoft into two independent companies, one owning Windows,

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[30] The Court drew a labored distinction between illegally defending a monopoly in the base market and illegally seeking like monopoly power in the related market, U.S. v. Microsoft, 253 F.3d 34, at 81-84 (2001), though both occurred here simultaneously by using the same cross-market leveraging tactics (e.g. exclusive dealing and product tie-in's), in service to a single business strategy. Apparently the second offense, but not the first, requires that the government *define* the related market. The reason for this difference is a mystery, at least to this observer. The Court held that product tie-in's in the "software industry" should be litigated case-by-case under the "Rule of Reason", involving an unstated number of "balancing factors", rather than the "per se" rules that remain applicable in other industries. This, the Court said, is because software is a new and technological complicated industry. *Ibid.* at 94-96. In fact, the *relevant economics* of the software business are not complicated: software markets are marked by the coincidence of closed standards and network effects, which makes the emergence of monopoly power nearly "inevitable" and makes its cross-market leveraging highly profitable. Litigating these economic realities de novo, case by case, will prove a waste of everyone's time and make the practical conduct of software businesses unnecessarily costly and uncertain.

the other Microsoft's various adjacent market products. This would have created a dynamically competitive industry structure in a single stroke and would have required very little post-judgment monitoring. But the appellate court reversed this remedy, deeming it too extreme. This is a common misunderstanding of US antitrust courts.[31] Corporate America undertakes such wholesale divestitures on its own hook all the time, generally to the benefit of all constituencies involved. But such a solution is unlikely to reappear in US or EU antitrust litigation regarding the monopoly leveraging of platform software programs.

The best long term solution for the monopoly leveraging problem is more aggressive government support of and assistance to industry-wide standard setting bodies, particularly those seeking to create and enforce technical "inter-operability" standards across the Industry. These bodies face big obstacles. Interested parties have many reasons and opportunities to force delays and introduce complications, and it is no easy matter for a "neutral" body to keep up with the numerous technical issues and changes necessary to maintain a viable standard in a dynamic industry. But the relative success of the major Internet standard-setting bodies suggest the task is doable, and it is almost always better to get a uniform standard in place than to waste time chasing after some technically ideal standard. The value-creating potential of successful standard-setting efforts is enormous and deserves vigorous government endorsement.

B. Electronic Networks

Since their advent in 19th century telegraphy, electronic networks have typically displayed strong natural monopoly characteristics. This has been due to *both* extreme scale economies (i.e. the high upfront cost of erecting or upgrading the networks) *and* pervasive network effects (operating among both network consumers and at the interface with content or programming services that can reach consumers only via the networks). Natural monopoly power has infected fixed line and cell phone telephone networks, radio and TV broadcast networks, cable TV systems networks, and satellite TV systems networks. (The Internet has uniquely avoided natural monopoly, but only because its launch costs were borne by the federal government and its network effects have remained uncapturable by private parties due to open interoperability standards.)

As a result, natural monopoly has remained a major dilemma for public policy regarding all electronic networks. Confusing, overlapping, and inefficient laws and regulations consequently enmesh the electronic network universe at all levels of government.

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[31] U.S. v. Microsoft, *supra* note 30, at 106-107. On divestiture remedies, *see* Thomas Sullivan, *The Jurisprudence of Antitrust Divestiture: The Path Less Traveled,* 86 Minn. L. Rev. 565 (2002); Thomas M. Leonard, *Creating Competition in the Market for Operating Systems: Alternate Structural Remedies in The Microsoft Case,* 9 Geo. Mason L. Rev. 803 (2001); R Craig Romaine & Steven C. Salop, *Slap Their Wrists? Tie Their Hands? Slice Them Into Pieces? Alternative Remedies for Monopolization in the Microsoft Case,* 13 Antitrust 15 (1999).

Currently, the most important debates in this area concern broadband (i.e. "fast") user access to the public Internet. Each type of electronic network is capable of providing such access (e.g. via DSL for fixed line telecommunications networks and various technical modifications for cable, broadcast, satellite, and cellular phone networks). However, in most cases, the particular network enjoys a *local* monopoly within its own technology space, facing competition only from networks based on other technologies (e.g. the phone company versus the cable TV company as one's broadband access provider). This local monopoly power constitutes the so-called "last mile problem" that lies at the center of most of the current legal wars concerning electronic networks.

These legal battles have raised five broad issues:

- Should public policy discourage the national consolidation of local monopoly networks within the same technology space?
- Should monopoly networks be required to "open" themselves to interconnection by competing networks at a regulated (e.g. marginal cost of interconnection) fee?
- Should public policy discourage the backward integration of electronic networks with content services?
- Should public policy discourage cross-ownership of networks between disparate technologies?
- Can new technology itself solve the "last mile" dilemma?

1. National consolidation of local monopoly networks?

Recent years have witnessed the rapid national consolidation of local players within each network technology space. The 1984 break-up of ATT produced eight regional phone companies and a long distance company (ATT), the latter facing competition from MCI. There are now only two and half giants in this vast space – SBC, Verizon, and Bell South – along with several smaller players. Similarly, the cable industry has morphed from a highly fragmented national landscape to a near duopoly of Comcast and Time Warner at the national level. Similar consolidating trends are evident in cellular telephony and satellite TV. Broadcast radio networks have condensed around Clear Channel, and TV broadcast networks seem stuck at five major players (NBC, CBS, ABC, Fox, and Univision).

Does this really matter in terms of Industry value-creation? The national consolidations have plausibly brought significant scale economy cost reductions in network infrastructure and operating routines, and arguably have done nothing to increase the local or "last mile" monopoly power of the companies vis a vis their consumers. Accordingly, federal antitrust authorities have generally hesitated to restrain the consolidating mergers, and the few exceptional cases of government objection (e.g.

disapproval of the proposed merger of Sprint and WorldCom) appear in retrospect to have been ill advised.

However, the national consolidations have led to serious value erosion by creating considerable *monopsony* power by networks over providers of network content (e.g. television program firms and cable TV channels). Indeed, reduction in programming costs has been a major motive for the national network consolidations. This is not a good thing: the competitive norm for value creation applies to supplier markets as well as to user markets.

But the issue is now moot. The national network giants now exist, and no one is seriously recommending their break-up.

2. Force electronic networks to "open up" to competing networks?

During the Clinton Administration, the FCC actively sought to force telecommunications networks to lease access to other providers of Internet access (so-called ISP's) and to competing local phone companies (so-called CLEC's and ALEC's). Extremely elaborate pricing regulations emerged, striving to keep these lease prices close to the marginal cost of the interconnection itself.[32] But low prices necessarily introduced the "free rider" problem. Because electronic networks require large upfront or launch investments, some monopoly pricing of network services is necessary to earn an adequate capital market return on launch and upgrade investments. "Opening" monopoly networks at low, regulated prices to competing networks erodes the monopoly pricing structure necessary for building and upgrading networks.

The regulations remained controversial on every side and spawned massive litigation and political lobbying at all levels of government. The policy of forced openness did trigger the entry of many new ISP and CLEC/ALEC companies into the telecommunications space, but nearly all of them went bankrupt when the dotcom bubble collapsed and, soon thereafter, the FCC changed course under the new Bush Administration. The Bush FCC pruned or eliminated the pricing regulations, and instead began to lean toward encouraging competition for phone and Internet access services between the cable and telecommunications industries.

Meanwhile, various industry and political partisans sought, through extensive litigation and legislative and regulatory lobbying, to force cable systems companies to open their networks to competing ISP's. This issue was, for instance, a major factor in FTC deliberations on the merger of Time Warner and AOL, the concern being that AOL would become a sole or preferred provider of ISP services over Time Warner's cable networks.[33]

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[32] For an entertaining memoir of Clinton era FCC's policies, by the FCC chairman at that time, see Reed Hundt, You Say You Want a Revolution, Yale U.P. (2000).

The current trend at the FCC and in the courts is against forced openness, for either telecommunications or cable companies.[34] Whether Congress will re-enter the fray on this issue, and seek to redraft the 1996 Telecommunications Act, no one knows. The effort would take a long time and would no doubt be driven by competing industry lobbies rather than economic logic. For now, competition in the market for broadband Internet access is pretty clearly a contest between the national giants of the cable and telecommunications sectors, with each player enjoying a "last mile" monopoly in its own technology space. In short, each household and business desiring broadband access will face a duopoly. Whether the result will be quasi-competitive or quasi-monopoly pricing options is not something economic theory can unambiguously predict. Duopolies pose an indeterminate situation as regards pricing behavior, with "game theory" capable of indicating a variety of outcomes.

3. Backward integration of electronic networks into information/programming content

Should monopoly networks be legally permitted to own content providers, e.g. cable channels and TV program producers, or to form exclusive or preferential alliances with content companies?

Many already do these things. Big cable systems companies have always held major ownership stakes in many of the leading cable channels, and Comcast even contemplated buying Disney; broadcast TV networks have for a number of years sought to produce their own programs; the big telecommunications network companies regularly make plans to develop or buy content providers. Government agencies have generally turned a blind eye to such practices.

The practices can obviously have anti-competitive tendencies. Network ownership can balkanize the content industry and increase significantly the cost and difficulty of entering that industry. That said, there are several reasons not to ban backward integration:

- The content industry (a mix of "creating" and "marketing" functions) has very few "natural monopoly" characteristics. So it is almost impossible to monopolize. Cross-market leveraging of monopoly power is therefore unlikely to happen

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[33] See Alec Klein, Stealing Time (2003), and D.L. Rubinfeld & H.J. Singer, *Open Access to Broadband Networks: A Case Study of the AOL/Time Warner Merger*, 16 Berkeley Tech. L.J. 631 (2001).

[34] The Supreme Court recently affirmed the FCC's determination that cable systems companies need not open themselves to linkage by competing ISP's. National Cable & Telecommunications Association v. Brand X Internet Services, 545 U.S. ____(June 27, 2005). The FCC is expected to move next to free telecommunications companies of open network connection obligations.

through backward integration into the content business. And indeed, the networks engaging in backward integration don't really hope to gain durable monopoly power over content. They are seeking instead to differentiate the primary network product or to hedge against the rainy day when network monopoly power itself wanes under the forces of technological advance.

- Cable networks and broadcast networks that have attempted backward integration have swiftly found that, to maximize total profits, they also have to buy and sell content to and from their backward-integrating competitors. This of course does away with any monopolizing potential for backward integration. (Indeed Viacom has recently decided to split into two companies, one owning the CBS broadcast network, the other holding most of the cable channel and movie and TV program production assets.)

- With broadband access, virtually all content can be served directly to users via the Internet. Soon, for instance, cable channels and TV programs will be directly available on any computerized viewing device. Because providing broadband access is the prime competitive arena between cable, telecommunications, and cellular networks, none of these will in fact be able to provide "exclusive" access to content.

4. Cross-ownership between network technology types?

The FCC's cross-ownership rules have traditionally focused on co-ownership of newspapers and TV stations in the same local markets. Today, however, the pertinent issue is co-ownership of disparate broadband access systems in the same local markets.

Cross-ownership of this type is not itself objectionable: it helps, not hinders, competition when a telecommunications company launches its own cable system, or a cable company converts its system to carry phone calls. The problem arises only if the cross-ownership is accomplished by acquisition or merger, thereby reducing a duopoly to a monopoly in a local market. It would, for instance, be extremely value-eroding for Verizon to buy Comcast, or Time Warner Cable to merge with SBC.

Fortunately, such issues can be readily handled through the conventional antitrust standards applicable to horizontal mergers. All that is necessary is to recognize that broadband access in any particular locality constitutes a "horizontal" market.

5. Can new technologies dissolve the "last mile bottleneck"?

The last mile bottleneck is caused by the high cost of stringing wires or cables or mobile phone "cells" from a major Internet access node out to individual homes and businesses. These high costs generate extreme scale economies and thus natural monopoly power. In many cases, the network company also manages to win some sort of "exclusive franchise" from local or state government. But this franchise is merely frosting on the cake. The high launch costs are enough to produce the monopoly bottleneck.

The best solution on the current horizon is the next generation of Wi-Fi technology. Today's Wi-Fi systems offer low cost, wireless Internet access over distances of about 100 yards. But the next generation systems, labeled WiMax, are projected to offer broadband access at distances of 20-50 miles.[35] This means the system would require only a few "transception" towers to cover vast municipal or suburban areas, and therefore the per user cost of erecting or upgrading the system would be very low. This low cost would substantially dissolve the last mile bottleneck. In effect, there would no longer be any need for copper wires or TV cables into homes and businesses: everything now done by these means could instead be done via wireless broadband access to the Internet.

Led by Intel, which is developing WiMax chips which it hopes to embed in all PC devices (including computer-enabled cell phones and TV sets), a group of big technology and networking companies is very rapidly progressing on all elements of this new technology, aiming for mass market roll-out within the next 18-30 months.

Whether this promise is fulfilled, however, will depend on the course of public policy at all governmental levels over the next several years.

- The industry-wide protocols and standards for WiMax are now nearing completion, but progress would be helped by firm federal government endorsement and encouragement of the effort, signaling for instance disapproval of any company-interested lobbying to delay or sabotage the effort.

- The FCC will have to free enough radio spectrum for WiMax. Various species of that technology could – via "frequency hopping" that taps underutilized radio wave capacity -- largely avoid the spectrum interference problem that has for decades served to justify exclusive FCC spectrum allocations to particular companies and uses.[36] But the simplest near-term solution is for the FCC to clear a comfortably broad frequency range for WiMax. One expects that certain status quo spectrum owners, and certain large fixed-line network companies, may try to discourage or impede the FCC in this effort.

- Perhaps most important, the federal government, states, and/or local governments will need to sort out the basic question of "ownership" for the WiMax towers. If a single company in a locality is afforded an exclusive franchise to build and operate these towers, that company could of course charge users a monopoly price for WiMax broadband access, in effect re-introducing a last mile monopoly bottleneck. More ominously (and predictably), exclusive tower ownership by an

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[35] For updates on the progress of WiMax technology, *see* www.wimaxforum.org and www.wimaxtrends.com.

[36] Regarding the many spectrum allocation issues raised by wireless digital technologies, *see* Thomas W. Hazlett, An Essay on Airwave Allocation Policy , AEI-Brookings Joint Center for Regulatory Studies (2001) and FCC Spectrum Policy Task Force Report, ET Docket No. 02-135 (November 2002).

existing fixed-line networking company would result in WiMax service pricing designed to preserve the monopoly advantages of the owner's other network(s).[37] One can expect entrenched network companies to attempt this tactic, because their obsolescence via WiMax would eventually destroy hundreds of billions of dollars of stock and credit market capitalization. There are two alternate solutions. The first would simply permit all comers to build and own WiMax towers in a locality. Because of the relatively low upfront investment needed, one could expect several tower systems to develop in each locality, and competition between them would keep prices low to the user community. There would not likely emerge an unsightly "forest" of towers, in part because the returns from building a system would not justify such proliferation, and in part because the wide transception range of the technology requires so few towers per system. The second solution is for a locality to grant an exclusive franchise to one tower system owner (or to itself) but also to require that owner to lease use of the system to all ISP's on equal terms. The lease costs would get baked into the fee each ISP charges to its users, but inter-ISP competition would keep these fees low and therefore set a ceiling on the tower system owner's lease charges. This solution has the obvious downside, however, of turning the tower system owner into a public utility or regulated "carrier", requiring that some agency "regulate" the whole system. History does not reflect kindly on the efficiency of such arrangements.

At any rate, these public policy issues surrounding WiMax will no doubt become one of tomorrow's great business and legal battlegrounds for the digital Information Industry.

Conclusion

Two broad problems restrict the value which the Information Industry currently contributes to the general economy: a confused and overreaching system of intellectual property rights, and the natural monopoly forces that extreme scale economies and network effects (abetted by "proprietary" inter-operability standards) inflict across the Industry's distribution functions.

The property rights problem derives from major imperfections in contemporary intellectual property law. The goal of this law is to balance incentives to create new information against value generated by the costless sharing of digital information. Copyright and patent law have erected such broad and vague definitions of intellectual

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[37] The major telecommunications companies are actively lobbying state legislatures and Congress to bar municipalities from building and owning wireless Internet access systems. For a current update on these efforts, see www.wi-fiplanet.com. The Los Angeles City government recently began to consider these issues. *Fast & Easy: The Future of Wifi and Beyond in the City of Los Angeles*, Mayor's Wifi and Beyond Executive Advisory Panel, April 25, 2005.

property that both sides of the balance are damaged. The definitions sharply erode the value of free use but, in the process, so restrict access to past information as to hamper the creation of new information.

There are two solutions.

One is to reform intellectual property law, e.g. providing a clear trigger event for copyright and sharply limiting the duration and scope of copyright coverage, and doing away with the patentability of Information Industry software.

The second solution is to junk intellectual property law for digitized Information Industry information and replace it with governmental protection of DRM technologies. This would introduce a new species of "physical possession" property. DRM would likely create a more hermetically sealed "private domain" than today's, but it would likely be smaller, and its contours (the terms and conditions for entering and using it) would be far clearer than is provided by contemporary intellectual property law.

The value-added equation would obviously differ substantially between these two solutions, but this author at least remains agnostic as to which would best serve general economic prosperity, convinced only that either would be better than a confused regime that merely adds DRM protection to the current imperfect system of intellectual property law (which is however the course we are now on).

The natural monopoly problem in the Industry's distribution segment centers on platform software and on fixed-line electronic networks.

The platform software problem is difficult to remedy via antitrust litigation. The most efficient public policy regarding the problem is aggressive government support for the rapid adoption of industry-wide "open" standards for the interoperability of software products. This solution preserves, indeed enhances, the value-creating potential of network effects but prevents the monopolistic "enclosure" of those effects behind proprietary interoperability standards.

The electronic network problem traces ultimately to the high cost of building fixed-line networks out to the "last mile" to individual households and businesses. Only new technology can reduce that cost, and WiMax technology seems poised to do just that over the next few years. But for WiMax to bear fruit for the general economy, government policy will need to help the technology overcome predictable political and legal barriers. It is particularly important that state and local governments prevent existing fixed-line network companies from securing exclusive, monopoly franchises to build and run tomorrow's WiMax tower systems.

Few of the proposals suggested in this paper would find favor with companies that have profited handsomely from the imperfections in intellectual property law or the natural monopoly forces surrounding platform software and contemporary electronic networks.

Normative economics does not seek to maximize profits but instead to maximize the sum of profits and consumer surplus – to optimize general prosperity.