End Notes

THESE NOTES ARE SUPPLEMENTAL INFORMATION FOR THE CHAPTERS TO WHICH THEY BELONG. They are listed in the order the chapter follows, but aren't necessarily bound to specific sections.

Chapter 1

Prosumers and the Third Wave

Offline do-it-yourselfers are well known. Thanks to the Chinese Executive M.B.A. class member who asked me if online DIY uploaders were related to the pro-sumers talked about in Alvin Toffler's *Third Wave*. In the strategy field, Chan Kim and Renée Mauborgne (both of the business school INSEAD) have written the article "Value Innovation: The Strategic Logic of High Growth" (*HBR* Classic), in which they discuss the customer becoming an integral part of the value chain, not just the receiver of an end product or service. Their *HBR* article discusses the impact on competitive strategy in a range of offline, consumer-focused businesses, from hospitality, movie theaters, to retail furniture stores. These new user-producers, as in the case of IKEA, are willing to become co-producers and home-based constructors of home furnishings, contributing their valuable individual time and effort in return for company-offered service and brand features such as personalization, style, immediacy, and convenience.

Online DIY and the experience economy

B. Joseph Pine and James Gilmore's book *The Experience Economy: Work is Theater and Every Business a Stage* (Harvard Business School Press), was an early prediction of a major shift in society and business markets toward active participation—experiencing, doing, seeing for yourself, and personalizing. Max Lenderman's book, *Experience the Message: How Experiential Marketing is Changing the Brand World* (Carroll & Graf) looks at the implications of this social shift within marketing.

Uploaders

Kevin Kelley, author of the prescient *Out of Control* (Addison-Wesley) and the classic *New Rules for the New Economy* (Penguin), wrote a must-read article in *Wired* for the 10th anniversary of the Web, dating the Web from Netscape's IPO in 1995. In the article, "We are the Web" from *Wired* 13.08, he noted that we had reached a "crossover point" in 2005 at which, there was more digital content being uploaded to the Web than downloaded. That implied that active uploaders—givers, creators, and contributors—were finally taking over from passive downloaders—takers, readers, and viewers.

Collective user value

In his book the *Wealth of Networks: How Social Production Transforms Markets and Freedom* (Yale University Press), Yochai Benkler, Yale law professor, explores the social and economic implications of a "gift" economy, in which intangible and tangible monetary rewards influence our behavior. In a very similar vein, Steve Weber, professor of political science at U.C. Berkeley, examines the complex social, political, and economic interactions underlying open source communities in his book, *The Success of Open Source* (Harvard University Press).

With a very different framework and approach, Rick Levine et al.'s *ClueTrain Manifesto: The End of Business as Usual* (Perseus) and Eric Raymond's *The Cathedral and the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary* (O'Reilly)—books that were themselves products of collaboration and interactive feedback online—argue that markets are not company-controlled seats, eyeballs, end users,

or consumers—but human beings, individuals, equals with a voice, having conversations and interaction. And by doing so, irreversibly scrambling and re-mixing the number and power of linkages away from the typical company-to-customer, buyer-seller business transaction and one-way communication.

Freemiums

The conversation that created the word "freemium" took place on venture capitalist Fred Wilson's blog (*http://avc.blogs.com/a_vc/2006/03/my_favorite_bus.html*). Katherine Heires also wrote on related subjects in "Why It Pays to Give Away the Store," in the November 2006 issue of *Business 2.0* (*http://money.cnn.com/magazines/business2/business2_archive/2006/10/01/8387115/index.htm*).

Public and open sharing of online digital content, trust, and communities of practice

Larry Lessig's framework presented in *The Future of Ideas: The Fate of the Commons in a Connected World* (Vintage) explains how the explosion of innovation from the Web relies on it being an open forum for ideas, and a community and ecosystem of knowledge creators, thinkers, and combiners. This is the basis for the movement behind Creative Commons.

The Semantic Web and metadata

Tim Berners-Lee in *Weaving the Web* (Collins) talks about the Semantic Web as one of the paths toward "scaling intuition" or allowing group intuition because individual readers notice relevant relationships and create a shortcut link to record it so that creativity, feedback, and knowledge about any problem or idea can occur across larger and more diverse groups and be stored across time. Metadata, like hyperlinks, are a kind of human-added information shortcut, indexing, or annotation that allows information links and knowledge synapses to be integrated and multiplied.

Digital photo ecosystem and flickrized ecosystem

The linear value chain compared to the value constellation or the more transient online value clickstream talked about by Nick Carr, former *Harvard Business Review* editor, in his blog (*http://www.roughtype.com/*). Of course, open APIs have

a key role in supporting this system and will be discussed in later chapters.

Flickr's founders

Josh Quittner wrote "The Flickr Founders" for *TIME*, available at *http://www.time.com/time/magazine/article/0,9171,1186931,00.html*.

Contexts for interaction

See John Musser's *Web 2.0 Principles and Best Practices*, O'Reilly Media, 2006, page 72 and surrounding.

Business model analysis for the entrepreneur

After using several different textbooks and articles for teaching my M.B.A. classes in entrepreneurship and venture capital, I can highly recommend Richard Hammermesh's "Note on Business Model Analysis for the Entrepreneur" Harvard Business School. It is the only business model framework that seems to work equally well in conveying the basics of how to analyze offline versus online as well as hybrid business models. It does a stellar job of focusing attention on the cash flow curve and individual customer profitability analysis rather than trying to generate a product-based balance sheet and pro forma. The two illustrative but brief cases he uses—The Grateful Dead and 7-Eleven in Japan—are always favorites.

Burn rate and J-curve cash flow analysis

As Figure 1-8 shows, the burn rate is the negative slope of the curve and the rate that investment dollars are flowing out or being "consumed" by the entrepreneurial bonfire per unit time. In my teaching, I tend to call the cash flow curve a J-curve—not only because of its distinctive shape but in honor of the well-known venture capitalist Steve Jurvetson's J-curve blog. Several of his classic venture capital investment insights are captured in the *HBR* article, "Bringing Silicon Valley Inside," in which he argues for the strategic borrowing of venture-capital-style thinking for managers in large corporations and multinationals.

Netflix financials and new customer acquisition cost

The HBS case *Netflix.com* is a gem because it was written for M.B.A.-level finance and accounting courses to illustrate how to calculate individual subscriber cash flow curves over time

as well as customer retention (usually in percent of total retained at one month, three months, six months, and yearly) so that these calculations can be used to generate aggregated (over total subscriber/customer numbers) and discounted cash flows to come up with average customer lifetime values. I present only a simplified and nondiscounted calculation to show that the new customer acquisition cost can be estimated as the cost of 3 DVDs and shipping or $3 \times 20 = \$60$ of DVDs + \$3 of shipping, but free customers bring in only \$20/month if they stay past the first free month. The HBS case presents enough quantitative data and market information to calculate or perform *sensitivity analyses* for three or four strategic scenarios—dropping the free month trial, raising the subscription fee, lowering the number of free DVDs from four to three to two, etc.

Single customer/subscriber cash flow analysis

Per user revenue, average lifetime value, customer profitability analysis, and brand equity. See HBS notes *Customer Profitability and Lifetime Value* and *Subscriber Models*. The key importance of loyalty or customer retention in online customer-focused businesses is discussed in the *Harvard Business Review* (*HBR*) article, "E-Loyalty: Your Secret Weapon on the Web." The *HBR* article "Diamonds in the Data Mine" provides a compelling real-world example of how HBS professor-turned-CEO of Harrah's used individual customer analytics for both profitability and competitive advantage.

S-curve, new technology adoption, and crossing the chasm

S-curves and technology diffusion follow a similar path and have a similar shape as infectious or viral disease epidemics. New technology adoption is explained in the classic work of Everett Rogers, *Diffusion of Innovation* (Free Press), in which he first introduces the concept of different groups of the population having distinctive behaviors and attitudes toward technology—early adopters, mainstream users, laggards. A good summary is available in the HBS note, *Note on Innovation Diffusion: Rogers' Five Factors*. But the original book is well worth reading in its entirety.

In his bestseller on high-tech marketing, *Crossing the Chasm* (Collins), Geoffrey Moore introduces the strategic concept of the "chasm," the gap in usage and expectations between early technology adopters and mainstream users turns out to be the downfall for many high-tech companies that look quite promising in their early stages but fail to "cross the chasm" to build and sustain a mainstream market.

There is much more on this subject in Chapter 3.

Company financial valuation methodologies

See William H. Sahlman's HBS note *Venture Capital Valuation Problem Set*; see also Mauboussin's Legg Mason Analyst Report "Valuing Customer-Focused Businesses."

Entrepreneur/founder's net worth at exit

Again, see William H. Sahlman's HBS note *Venture Capital Valuation Problem Set*, specifically the section on dilution and IPO value. There's clearly a significant structural shift in the venture investing and private equity environment due to large Internet players like Google and eBay snatching up YouTube and Skype at IPO-level public market valuations. The shift is also evidenced by Microsoft ratcheting up the value of Facebook, buying minority stakes at levels that would put the total market capitalization of Facebook at a lofty $15 billion (similar to an Intel or Oracle). This section doesn't include any inside information on the actual net worth of these different founders, but it does provide a perspective on the relative difficulty of IPO as an exit for online companies after the dot-com boom compared to the frothy and active acquisition market available for Web 2.0 companies.

The following HBS notes show how venture capitalists value their portfolio companies and the process of dilution through different stages of investment funding: *How Venture Capital Works*; *The Process of Going Public in the United States*; *Introduction to Valuation Multiples*; *A Method for Valuing High-Risk, Long-Term Investments: The Venture Capital Method*; and *The Basic Venture Capital Formula*." I haven't used the HBS note *Funding New Ventures: Valuation, Financing and Capitalization Tables*, but it sounds like it might actually provide a set of cap tables to use, so you don't have to calculate them out.

Funding requirements of Web 1.0 versus Web 2.0

For some background on venture financing, take a look at the James McNeill Stancill *HBR* article "How Much Money Does Your New Venture Need?"

Chapter 2

Negative network effects and traffic congestion

As noted in the Wikipedia entry for network effects, after a certain point, most networks become either congested or saturated, preventing future uptake. Congestion occurs due to overuse. Another applicable analogy would be that of a telephone network. While the number of users is below the congestion point, each additional user adds more value to every other customer. However, at some point, the addition of an extra user (n+1 if n is the number of users) exceeds the capacity of the existing system. After that point, each additional user decreases the value obtained by every other user. In practical terms, each additional user increases the total system load, leading to busy signals, the inability to get a dial tone, and poor customer support. The n+1 person begins to decrease the value of a network if additional resources are not provided.

Congestion point and total market size

In the online Web 2.0 world, hypergrowth and scaleability in the number of users and usage has a much higher limit because the congestion point may be larger than the total market size. Skype is an example of a peer-to-peer network that distributes its load among the user pool, allowing each user to add traffic capacity and routing management to the system. See the HBS case *Skype, Inc.* for background reading on Skype.

Network effects and network externalities

In economics, an externality is an impact (positive or negative) on anyone not party to a given economic transaction. Negative externalities include tragedy of the commons and

secondhand smoke. Positive externalities include education and technology spillover. The key difference in the economic literature between network effects and network externalities is whether the value or impact of an additional user on other network users is internalized or captured. Another aspect of economic concern is how network effects value is internalized—whether the capture of the benefits or the distribution of multiplied network value is private (by the provider of the network platform), public (available to the users of the network), individual (distributed or monetized by individual users), or social (actively distributed in the aggregate as in a community of practice).

Internalizing externalities and the knowledge economy

This is why Web 2.0, with its strong network effects and interactivity, could accelerate the growth of a global knowledge economy and stimulate the online communities necessary to practice-based fields like education and increasingly interdisciplinary scientific domains like nanotechnology and biotechnology. Dominique Foray's comprehensive book *The Economics of Knowledge* (The MIT Press) points out that Ronald Coase, Nobel Prize winner in Economics and author of *The Firm, The Market, and the Law* (Univesity of Chicago Press), also predicted that large-scale value capture of knowledge spillovers, information externalities, and consumer surplus would occur if the costs of collaboration, especially transaction costs between consortiums of firms could be reduced.

Network value creation

Robert Metcalfe, the founder of Ethernet, used the term network effect to argue that a certain critical mass of Ethernet card customers was necessary for the network to create value—the cost of n nodes or users is proportional to the number of networking cards/units installed, but the value of the network is arguably proportionate to the number of 1-1 linkages that have been enabled in the network of n nodes, that is n x (n-1) or approximately n squared. This algebraic relationship between number of nodes and number of two-party linkages is behind the notion that network value increases exponentially by a power of 2, rather than only

incrementally or via a value-added process in physical goods markets. So, if the cost of a network card was $1, and the value of each network link was $1, a 10 member network would be worth $100 to each of the network members who had paid $1 to join; and a 100 member network would be worth $1000 to each of the network members.

Bill Gross, founder of GoTo/Overture quotations

The story of GoTo/Overture and the comments of Bill Gross, its innovative founder, are detailed in John Battelle's fascinating and comprehensive book, *The Search: How Google and Its Rivals Rewrote the Rules of Business and Transformed Our Culture* (Penguin Group). This chapter reinterprets the events of the competitive race between GoTo and Google with a network effects and two-sided market framework. In contrast, Bill Gross refers to his paid keyword strategy as an "arbitrage" strategy, the practice of taking advantage of a price differential between two or more markets and profiting from the difference in market prices or currencies. Without going into a great deal of theoretical detail, these are two very different explanatory models of why it might be worth 5 cents for a search engine to acquire a new search user to get advertisers to pay 1 cent or more for that search user's pay-per-click keyword advertising.

Performance-based online advertising, pay-per-click keyword advertising, pay-per click

Performance-based online advertising using pay-per-click allowed advertisers to measure the effectiveness of an online ad to change viewers' behaviors (to actively click compared to passively viewing an ad) and pay based on those measurable clickthroughs. At first, most Internet ads were banners and followed the media payment method of offline advertising called CPM, a payment or cost based on the number of impressions or viewings or "eyeballs" reached. However, in the HBS note *How Media Choices are Changing Online Advertising*, its authors (Bradley and Bartlett) mention that in April 1996 it was the powerful Procter & Gamble that convinced Yahoo! to switch its online ads to PPC clickthroughs

rather than CPM. By 2004, 41% of all online ads were performance-based.

For those readers unfamiliar with the traditional offline media and advertising world, good background reading is Harold Vogel's *Entertainment Industry Economics: A Guide for Financial Analysis* (Cambridge University Press), *Ogilvy on Advertising* (Vintage), and *Confessions of an Advertising Man* (Southbank Publishing), (the latter two by the advertising legend David Ogilvy). For those readers interested in the early rich media trends in online advertising, take a look at the 2003 HBS case *Eyeblaster: Enabling the Next Generation of Online Advertising*.

Paid keyword search and organic keyword search or SEO (search engine optimization)

Paid keyword search or PPC on Googles's AdWords or Yahoo!'s Search Marketing (formerly GoTo/Overture) results in a small text ad in the sponsored link section. However, as explained further in this chapter, the average cost per click for the top placement spots keeps rising due to advertiser "willingness to pay" demand—sometimes 15% or more per year, making it difficult to estimate a ROI for advertising spending or an online marketing campaign. The SEO process of trying to get a web site to the top of the listings for organic search results is a lengthier and much less straightforward process.

ROI metrics and web analytics

Pay for performance online advertising and PPC keyword advertising opens up a whole new world of immediate, real-time, quantitative clickstream data for marketing analysis, customer behavioral tracking, and data-mining. Online advertisers—whether individuals, small businesses, or large corporations—can measure and monitor their advertising ROI dollars or cents—on a minute, hourly, or daily basis, as well as continually experiment with tweaking keywords, keyword combinations, and keyword pricing and page positioning.

The web analytics and online marketing tools provided with a service like Google's AdWords are very powerful and sophisticated enough for the savvy marketer and allow even the

smallest advertiser to become extremely cost-effective at targeting online advertising spending.

See the *HBR* article "Competing on Analytics" and the book, *Competing on Analytics: The New Science of Winning* (Harvard Business School Press), authored by Thomas Davenport and Jeanne Harris. Although written primarily about offline quantitative analysis, it reminds us that real-time data can often give us insight and early warning into unexpected or invisible shifts in the business environment and marketplace, as well as test the validity of our previously successful recipes and ways of doing business.

U.S. and global advertising expenditures, specifically online advertising industry analysis and quantitative models

See Christa Quarles', a Thomas Weisel Partner, September 2006 *Investment Analyst Report on Internet Services* and quarterly updates.

Critical mass, one-percenters, and uploaders

See Chapter 3 endnotes.

Compatibility and complementary products and service

Ecosystems and indirect network effects arise from compatibility in standards and complementary products and services. One very well-known example comes from Professors Michael Katz and Carl Shapiro's economic brief during the court battles around Microsoft.

N-sided markets and ecosystems

Professor Marco Iansiti and Roy Levien's book *The Keystone Advantage: What the New Dynamics of Business Ecosystems Mean for Strategy, Innovation, and Sustainability* (Harvard Business School Press) looks at n-sided markets from the perspective of business ecosystems. It also discusses the strategic advantage gained from being a keystone, hub, platform provider, or orchestrator in connecting multiple businesses. They use Visa, American Express, Microsoft as well-known examples in the research literature.

N-sided markets and online networks

See the *HBR* article "Strategies for Two-Sided Markets" by Professor Thomas Eisenmann. It provides an overview of the industrial economics approach. His examples emphasize the connection of n-sided markets to online and offline networks, using examples such as Google, Craigslist, and eBay; as well as open system hardware platforms, such as Linux supported by IBM, Sun, and HP.

N-sided markets and the value of a free customer

"What is the value of a 'free' customer?" (*http://www.hbs.edu/research/pdf/07-035.pdf*), a working paper published for comment on the Web by a HBS marketing professor, looks at the connection between two-sided markets and online free services. (An interesting commentary is available on Nick Carr's blog [*http://www.roughtype.com/*]). eBay and Monster are used as examples of profitable online transaction revenue model businesses through n-sided markets, although empirical analysis is done with data from a conventional offline auction site.

Synthetic worlds and two-sided networks

Edward Castronova's book *Synthetic Worlds: The Business and Culture of Online Games* (University of Chicago Press) explains the active digital macroeconomics of gaming worlds, like World of Warcraft, as primarily due to "arbitrage"—the fact that there's a difference in real-world versus digital-world economic systems regarding how labor is linked to the production of goods, pricing, and economic growth. Additionally, the utilities, preferences, and economic behavior of the online gamer is distinguishable in many ways from the average realworlder. This also seems to apply to the macroeconomics of Linden Labs' Second Life—a 3-D virtual world entirely created by users (*http://secondlife.com/whatis/*).

Unfortunately, I could not find a similarly comprehensive economic overview and analysis of Second Life, although there are many business articles and several guide books, including Paul Carr and Graham Pond's *The Unofficial Tourists' Guide to Second Life* (St. Martin's Griffin), as well as one with the highly promising title of Julian Dibbell's *Play Money: Or, How I Quit My Day Job and Made Millions Trading Virtual*

Loot (Basic Books). However, arbitrage tends to be a chance to make money on price differentials due to temporary disequilibrium. My own microeconomic explanation would focus on two-sided markets and cross-network effects and argue that there is stable perfect price differentiation—where one group is willing to use an online service or good for free and contribute direct positive network effects, another group is willing to pay or sponsor with a premium price because of dynamic pricing, high ROI, and/or cross-network and indirect network effects.

Increasing returns

Brian Arthur, a Stanford professor and external professor at the Santa Fe Institute, is the founding father of "increasing returns economics." His research was part of an influential white paper that helped block the Microsoft buyout of Intuit, arguing that increasing returns can stifle innovation in emerging markets by locking customers into inferior technical standards too quickly.

Demand-side driven scale economies

"Demand-side Drive Scale Economies" is a great investment analysis white paper on network economics, authored by Michael Mauboussin, now of Legg Mason. I first started to search for Mauboussin's investment reports after reading the fascinating comments and insights attributed to him in Nassim Taleb's book, *Fooled by Randomness: The Hidden Role of Chance in Life and in the Markets* (Random House). The willingness-to-pay diagram in this chapter is inspired by diagrams in his report, available on the Web, but my explanation is modified to apply to online network business examples.

Power laws

Power laws on the Web and elsewhere are explained in Albert-László Barabási's book *Linked: How Everything Is Connected to Everything Else and What It Means* (Plume), along with a broad and fascinating look at the implication of networks in many fields from physics to social sciences and biology as well as everyday life. Power laws, in particular, mean that most of our experience in statistics and our commonplace intuition about "normal" distributions actually mislead us when it comes to exponential curves and strong network effects.

Long tail

Chris Anderson's book, *The Long Tail: Why the Future of Business Is Selling Less of More (*Hyperion) provides a focused look at the implications of power laws for businesses in all sorts of industries from entertainment and radio to retailing and online businesses. It is wonderful reading with great examples.

AdRank

Page listing rank placement due to an ad's popularity measured by clickthroughs, as explained in Battelle's book *The Search* and discussed subsequently by a number of bloggers.

Wisdom of the crowd

The Wisdom of Crowds (Anchor) is the title of the best-selling book by James Surowiecki. Google's search algorithm tracks the clicks and choices people make on the Web— what links they follow, what sites they look at, and what links and words they use in their own sites—and uses that information to make a dynamically updated calculation and weighted aggregation of the crowd's collective judgment or "wisdom" about popularity, authority, timeliness, importance (the criteria for the results served up by Google, Yahoo!, and other search engines). So, in some way, Google is data-mining the wisdom of the crowd, running it through its algorithm, and then selling that newly aggregated wisdom back to advertisers in the form of targeted keyword advertising.

In his famous "What is Web 2.0?" essay, Tim O'Reilly reminds us that this is not a matter of encouraging the active participation of web users and uploaders as in Flickr's collective user value, but more like collecting the "crumbs" of wisdom left as users journey through the hyperlinks of the Web. A fascinating discussion started by Om Malik's blog (*http://gigaom.com/2005/10/27/crowds-wisdom-who-owns-it/*) raises the controversial question, "Who owns the wisdom of the crowd?" Or to pose this same question with a more revenue model spin—"Who captures the value and monetization of the wisdom of the crowd?"

Arguably Google does and then turns around and redistributes the benefits to an ecosystem of new-to-online advertisers and highly popular bloggers.

Blogging for dollars

"Blogging for Dollars" was a catchy front page article by Paul Sloan and Paul Kaihla for *Business 2.0* (September 1, 2006). The article provided data on ad revenues of some of the most highly touted and widely read bloggers, as well as comparisons of the estimated revenue splits of Google Adsense with their ecosystem of bloggers compared to Federated Media and others.

Adsense and blogging

Adsense is the advertising platform that Google uses to serve ads to bloggers' web sites and redistribute a portion of the advertising payments for clickthroughs to the bloggers. Robert Scoble and Shel Israel's book *Naked Conversations: How Blogs are Changing the Way Businesses Talk with Customers* (Wiley) is recommended reading on understanding the business implications of the blogosphere—especially from the perspective of a former Microsoft employee/blogger. Also, it explains the concept of Google "juice," how interactivity, frequent links, and RSS impact page rankings.

Competitive races

Good background reading on this subject is the HBS note by Thomas Eisenmann, *A Note on Racing to Acquire Customers*.

Winner-take-all tippy market diagram

See this diagram in the must-read classic on digital economics and business, *Information Rules* (Harvard Business School Press), written by Carl Shapiro and Hal Varian. (Hal Varian is currently chief economist at Google.)

VHS versus Beta

The videocassette recorder market example used in Rosenbloom's original article is a well-known competitive battle of high-tech consumer electronic companies and standards. Several different explanations are possible—VHS was a standard

formed by JVC, which sought worldwide licensing, production, and distribution allies in Matsushita, GE, Phillips, Thomson. Beta was a standard formed by Sony, which chose to keep its technology proprietary and did not have any licensing allies. Comparisons could be made to IBM PCs with Wintel (Microsoft Windows plus Intel microprocessors) versus integrated Apple Macintoshes. However, *Information Rules* highlights the important crossover point at 50%, arguing for the presence of a strong network effect causing a tippy market to occur.

The AOL-Google Story

The AOL-Google Story is drawn from the HBS case *Google, Inc.* authored by Harvard Professor Thomas Eisenmann. Although there are other business school cases written about Google, this is a must-read for its attention to competitive races in networked winner-take-all markets. (The HBS explanatory notes on these specific topics are also authored by Eisenmann.) The case provided the contextual details and quantitative information on why the analysts at the time believed that Google had paid about $100 million too much in the AOL deal.

Tippy market

However, combining the Google case data with Christa Quarles' *Investment Analyst Report on Internet Services*—reporting market shares of search engine players in 2005—provided me with a significantly different perspective of the AOL deal as illustrative of a tippy market. The search market shares in 2005 reveal that Google was in a fairly vulnerable position because it was clearly in the battle zone for a tippy market, with AOL playing the swing vote.

Battle zone of a tippy market

Using Christa Quarles's report and its detailed models of revenue per search for different competitors in the search market supported my hypothesis that the clearly dominant 50+ market share leader in a tippy and highly networked two-sided market, like the search market, could receive more than 2× the average revenue per search query compared to search engines such as MSN or AskJeeves that were "one of the pack." This

became the basis for my simplified number back-of-the-envelope analysis of the financial implications of losing 7% market share for Google in a tippy market.

Web 2.0 path to growth and the freemium strategy

I first heard the term "freemium" in a *Business 2.0* article more than a year back and only recently realized that it was Fred Wilson, the venture capitalist, who first coined the term and used it in his blog. The original freemium strategy was stated as

> *"Give your service away for free, possibly ad supported but maybe not, acquire a lot of customers efficiently through word of mouth, referral networks, organic search marketing, etc., then offer premium priced value added services or an enhanced version of your service to your customer base."*

But don't try it without Web 2.0—low capital investment, collective user value, network effects, n-sided markets, and long tail ad-monetization together make this kind of freemium strategy work effectively now, but many pieces were missing before.

Chapter 3

Electronic communications and communities

The terms *electronic communications* and *electronic interactions* point to a much larger and richer body of work on *virtual communities*, *cyberspace identity*, and *educational and scientific online communications* that were not covered in this chapter. I suggest reading all of the books by Howard Rheingold, known as the First Citizen of the Internet, as he explores *The Virtual Community* (The MIT Press) in the late '80s, *Virtual Reality* (Simon & Schuster) in the '90s, and *Smart Mobs* (Basic Books) in the 2000s. Sherry Turkle explores the evolution of our electronic psyche and persona in cyberspace in the books *Second Self* (The MIT Press) and *Life on the Screen* (Simon & Schuster). Numerous academic articles analyze the collaboration and communication patterns of educational and scientific communities. Etienne Wenger's book on *Cultivating Communities of Practice* (Harvard Business School Press) is

considered a classic in the knowledge management field, with examples drawn from offline cases.

Local and social network effects

This chapter focuses on the socially mediated and socially influenced network structure of people connected or linked on the Web. This network structure or linkage pattern provides the basis for *local network effects*. In Malcolm Gladwell's popular book *The Tipping Point* (Back Bay Books), he provides many everyday and historical examples in which a small number of individuals were a *critical mass* or *threshold tipping point* in triggering exponentially large network effects. More business examples are available in the *HBR* article, "Tipping Point Leadership."

Social network effects, S-curves, emergence, and complex systems

We are all familiar with the surprisingly explosive growth of a *virus*, *epidemic*, or *forest fire*, but we're not used to thinking about them as exponential growth patterns or S-curves on a graph (See Chapter 1 endnotes). *Emergence: The Connected Lives of Ants, Brains, Cities, and Software* (Scribner) by Steven Johnson is a book with many interesting examples of systems showing emergent properties, including unregulated exponential growth or free-scaling. The Wikipedia definition of *emergence* points out that the Web is a popular example of a decentralized system exhibiting emergent properties. There is no central organization allocating the number of links, yet the number of links pointing to each page follows a power law (see Chapter 2 endnotes on power laws) in which a few pages are linked to many times and most pages are seldom linked to.

A related property of the network of links in the World Wide Web is that almost any pair of pages can be connected to each other through a relatively short chain of links, called *degrees of separation*. Although relatively well known now, this property was initially unexpected in an unregulated network. It is shared with many other types of networks called *small-world networks*. The study of complex systems looks at why very large decentralized and distributed systems with many independent actors (sometimes called agents or nodes) seem to act in a highly coordinated or organized fashion, although there is

no apparent hierarchical leadership but ad hoc, intermittent, or limited inter-node communication and linkage.

The book *Complexity: The Emerging Science at the Edge of Order and Chaos* by Mitchell Waldrop (Simon & Schuster) is a great introduction to this area and shows the connection of Brian Arthur's economics work in *increasing returns* to this field, as well as the exciting interdisciplinary beginnings of the Santa Fe Institute.

Local network effects, clusters, and Silicon Valley

Local network effects are also a type of social network effect because certain nodes or users are influenced directly by a small subset of local nodes that it is connected to, typically via an underlying social or business or locally geographical cluster, grouping, community, or neighborhood. In these cases, structural factors—such as extent, interaction, density, and the strength of ties of clustering in the network, along with social influence and information access—shape diffusion and adoption patterns. Silicon Valley is a good example of this, whereas Route 128 in Boston is not, according to the classic book on this subject *Regional Advantage* (Harvard University Press), written by Annalee Saxenia (now Dean of the School of Information Systems (SIMS) at U.C. Berkeley).

Social network analysis

This is a process of painstakingly mapping the nodes, linkages, and types of interaction in people-connected networks and groups that has been used extensively in both sociological and organizational business research. See "Using Social Network Analysis to Improve Communities of Practice," and "Making Invisible Work Visible: Using Social Network analysis to Support Strategic Collaboration" (both articles in the *California Review Management*—a UC Berkeley publication).

Connectors, mavens, and salesmen

Malcolm Gladwell's *New Yorker* article and best-selling book *The Tipping Point: How Little Things Can Make a Big Difference* split the well-researched social network broker/hub role into three distinct types that he calls, connectors, mavens, and salesmen. His stories seem to indicate that tipping points,

thresholds, or critical mass for social epidemics might require some level of interaction or interdependence between these different types of brokers, as recounted in the stories of Paul Revere and William Dawes.

A simplified summary might be that connectors are social glue, mavens are information brokers, and salesmen are catalysts to action. The collaboration or combination of all of these roles might be necessary to "trigger" a social epidemic. This is a fascinating "personification" of our theoretical understanding of the different factors necessary to innovation diffusion or the spread of disease—for example, with HIV, the presence of several highly socially and sexually active individuals, who are strongly contagious due to unsafe practices and who travel actively and extensively to many new areas and partners, can cause a local outbreak to explode into an epidemic.

Social epidemics, fads, viral marketing, buzz marketing, word-of-mouth marketing

The *HBR* article "The Buzz or Buzz" is a good overview of buzz marketing, looking at the widespread applicability in offline markets as well as common misconceptions. Two articles on viral marketing that provide helpful background, but are mostly focused on offline viral marketing: a *Business Horizons* article by Angela Dobele et al. called "Controlled Infection! Spreading the Brand Message Through Viral Marketing" and the *HBR* article by Duncan Watts, "Viral Marketing for the Real World." Several marketing and branding books look at this subject: Andy Sernovitz's book *Word of Mouth Marketing: How Smart Companies Get People Talking* (with Afterword by Guy Kawasaki) (Kaplan Business); *Brand Hijack: Marketing Without Marketing* (Penguin Group) by Alex Wipperfurth; *Buzz Marketing: Get People to Talk About Your Stuff* (Portfolio Hardcover) by Mark Hughes; *Citizen Marketers: When People Are the Message* (Kaplan Business) by Ben McConnell and Jackie Huba; and *Experience the Message* by Max Lenderman.

Online connectors, mavens, and salesmen, catalysts, and evangelists

The main question driving this chapter was: how does online change social network patterns particularly in viral marketing and diffusion, as well as small world network effects? So, those looking for ethnographic, anthropological treatments of cyber-community will be disappointed and need to search elsewhere. The chapter looks at the mechanisms behind the tipping of word-of-mouth epidemics in the online world, better known as viral marketing or buzz marketing. Ori Brafman and Rod Beckstrom's book, *The Starfish and the Spider: The Unstoppable Power of Leaderless Organizations* (Portfolio Hardcover), emphasizes the role of catalysts—active peers in our new decentralized un-organizations like the Web, Skype, or Napster—in triggering high-impact changes that ripple through the entire small-world group.

Ben Connell's book, *Creating Customer Evangelists: How Loyal Customers Become a Volunteer Sales Force* (Kaplan Business), considers the expansion and amplification of the traditional commercially-oriented salesforce through online communities, especially in specialized areas that have passionately loyal and dedicated users, including religion, music, and the arts. Many of these business concepts were discussed during the Web 1.0 era, for example, John Hagel III and Arthur Armstrong's *Net Gain: Expanding Markets Through Virtual Communities* (Harvard Business School Press), but could not be realized as effectively without Web 2.0 and widespread broadband and mobile penetration.

Snailmail

Snailmail refers to regular U.S. postal service, seemingly moving at a snail's pace in the physical, offline world compared to almost instantaneous email service online. (Hotmail is the free email service that became the leading example of viral marketing.)

Small worlds and leapfrog links

Additionally but somewhat separately, I also discuss the emergence of small worlds and leapfrog links in cyberspace. This is a more targeted usage of the Web's interconnected linkages to shortcut geographical and social distance by finding the shortest social distance path (or friends of friends' degrees of separation) online between you and someone you want to connect to directly. Small worlds, despite the name, are not really sustaining communities; rather, they are the outcome of exponentially increasing linkages within online networks along with superhubs, allowing each of us to be much fewer than six degrees of separation away from any other node on the Web—which is why an email sent to China might take the same number of "hops" as an email to someone in the same neighborhood who has a different Internet provider and social network linkage structure. The key readings in this area are Duncan Watts' books, *Six Degrees: The Science of a Connected Age* (W. W. Norton & Company) and *Small Worlds: The Dynamics of Networks between Order and Randomness* (Princeton Studies in Complexity)(W. W. Norton & Company).

LinkedIn and beyond

Harvard Business School cases *LinkedIn (A)* and *LinkedIn (B)* were written by HBS Strategy professor Mikolay Pikorski to illustrate strategy for online search business and how to monetize a 5-million-node business network. The same professor and Carin-Isabel Knoop also wrote HBS cases *Friendster (A)* and *Friendster (B)*, which focus on the social networking business and how Friendster tried to turn around its first-generation social network.

The HBS case *Monster Networking*, written by David Vivero and Thomas Eisenmann, looks at the challenges Monster.com—the successful Web 1.0 online recruiting leader—faced trying to integrate Web 2.0-style social and business networking into its services, through acquisition and internal development. Also see *MIT Tech Review* articles on social networking.

Stanford Case "Facebook"

This case is available through the HBS case distribution service (*http://www.hbsp.harvard.edu/hbsp/case_studies.jsp*).

Viral marketing, viral distribution and referral marketing, social and peer pressure

The *HBR* article "The One Number You Need to Grow," written by Frederick Reichheld, (also the author of the *HBR* article "E-Loyalty: Your Secret Weapon on the Web") reminded me that Tell-a-friend, referral marketing, and peer pressure (Facebook tells you how many of your friends have already signed up for a free Facebook application) are actually quite different than conventional viral or buzz marketing. One person doesn't broadcast or "infect" a large number of people; instead, a small number of friends, a cluster, or critical mass, acts as a mini-bandwagon, reducing the perceived risk of experimenting with something new. Rather than transaction costs you have invisible upfront "attention" or "threshold time to download a trial" costs.

Chapter 4

Dynamic capabilities

This term was first introduced in a working paper that David Teece and I coauthored to be presented as the organizing theme of the Napa Strategy Conference in 1989. The working paper was strongly influenced by my INSEAD collaborations and research—alliance processes (Doz & Shuen, 1989), competitive collaboration field studies (Hamel, Prahalad, and Doz), competence stocks and flows (Dierickx & Cool), and campus lunch discussions on firm-level resources with Edith Penrose (*The Theory of the Growth of the Firm* [Oxford University Press]) and Guy de Carmoy. David Teece's research influences included evolutionary economics and technological trajectories (*The Nature and Dynamics of Organizational Capabilities* [Oxford University Press]), absorptive capacity (Levinthal), and knowledge creation at the firm-level (*The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation* [Oxford University Press] by Ikujiro Nonaka and Hirotaka Takeuchi).

Worldwide business transaction costs

Ronald Coase received the Nobel Memorial Prize in Economics for his work on transaction costs as well as highlighting

the difficulties of internalizing network externalities effectively. In his work *The Economic Institutions of Capitalism* (Free Press), Oliver Williamson, a contemporary of Coase's, played an equally important role by adding two key concepts of transaction cost economics, largely missing from Coase's work but critical for application of transaction costs to online networks. They are (1) *specialized assets* fundamentally transformed faceless transactions into relationships with different economic characteristics, and (2) the *risk of opportunism* required economic and/or legal safeguards, including price premiums; collateral, credible commitments or hostages; or building a pattern of trust or reputation through interaction over time in a social or cultural context.

Friction in the transaction cost system

These are extra costs generated by the one-time summation of contractual, procedural, search, and "ink" transaction costs. This also includes the systemic and continuing transaction costs of market failures such as *sticky*, *lumpy*, or *complex* knowledge, technology, or information goods that are difficult to price or transfer efficiently in an economic transaction.

Multinetwork power, efficacy, and reach

An influential article by Axelrod et al. and the groundbreaking book *The Complexity of Cooperation* provides empirical evidence of multinetwork *power*—an unexpected gain in value and an inherently positive network effect of coordinating large numbers of firms that counterbalance the largely negative coordinative costs predicted by transaction cost economics. However, this research was based on networks of business transactions, not connected online networks of businesses. The best-selling book *Blown to Bits* (Random House) by Evans and Wurster, written in 2000 during the first generation of the Web, further argued that online networks allow efficiency, richness, and reach, whereas most previous businesses had to deal with tradeoffs between these dimensions because of transaction costs. They use the example of *Encyclopedia Britannica* versus Microsoft's Encarta.

Corporate strategy and innovation

Corporate strategy differs from plain old vanilla business strategy because it is defined as the strategy of multiple businesses, not just a single business. As such, there are tradeoffs as well as opportunities created by juggling a large number of businesses and strategic business units, each of them competing in a different industry and targeting different market segments and geographies. Corporate strategy must balance overall and individual business short- and long-term profitability, market share, and growth.

One well-known corporate strategy framework, the BCG Growth-Share Matrix—introduced by Bruce Henderson in the early '70s and applied by leaders like GE—categorizes businesses as stars, cash cows, dogs, or question markets, depending on their relative market share (cash generation) and market growth rate (cash usage). See HBS's *Note on the Boston Consulting Group Concept of Competitive Analysis and corporate Strategy*. Also see the *HBR* article "Competing on Capabilities: The New Rules of Corporate Strategy."

Strategic performance

As mentioned there are two different but complementary views of the determinants of strategic performance. Structural industry analysis, Porter's five-forces analysis, and the research streams of industrial organizational economics are the basis for many M.B.A.-trained stock market analysts. The resource-based approach to strategy (Penrose, Barney, Montgomery, Wernerfelt, Amit), and the evolutionary and innovation economics view does a better job explaining performance in high-tech industries where distinctive, hard-to-imitate capabilities, and intangible assets are linked to market valuation, growth, and profitability.

How these two contrasting views might actually underlie overall patterns of national competitiveness is explored in Hamel & Prahalad's *HBR* classic article, "The Core Competence of the Corporation." Japanese firms are described as following a primarily internal competence approach and U.S./western firms are characterized by an externally focused strategy approach.

Recombinant innovation

This term was popularized by Andrew Hargadon's book, *How Breakthroughs Happen: The Surprising Truth About How Companies Innovate* (Harvard Business School Press). In this chapter, I expand the usage of his original term in two very specific ways to better cover the emerging styles of collaborative online innovation described in later sections. First, peer-to-peer collaboration of older more established industry incumbents with newer startups is the primary focus, compared to the examples cited by Hargadon, which seemed to be more unidirectional—established technologies generated by industry leaders were applied in new application areas by startups in a kind of "fusion" or technology arbitrage play. Second, the chapter's emphasis is on making the analogy of recombinant innovation to recombinant genetic engineering much stronger and clearer.

Recombinant genetic engineering is not just the simple mixing of independent skills or competences, as in a team or ecosystem. Instead, both organisms/organizations end up being changed in a fundamental way by the insertion of new DNA material—the first, newer organism because it now has a more powerful infrastructure for viral replication and distribution, the second, host organism because it has received and accepted new DNA into its system from an unlike organism that could not have been internally generated.

Developing dynamic capabilities

The difficulty and economic costs of transferring complex technologies between companies is a consideration in international technology transfer (Teece), technology appropriability (Flamm, Dosi), gains and hazards in make versus buy decisions (Teece), and virtual versus virtuous companies (Teece & Chesbrough). One challenge is capturing individual skills, tacit knowledge, and know-how into organizational learning, processes, and "routines" (*An Evolutionary Theory of Economic Change* by Richard Nelson and Sidney Winter [Belknap Press]). Another is the relative slowness of the diffusion process of learning-by-doing (Argote & Beckman) and know-how transfer, even within closely coupled technology collaborations (Shuen).

The seminal article on "Communities of Practice within Xerox PARC" was published in *Management Science* (Brown and Duguid, 1991). Thomas Stewart's *Fortune* articles from *The Invisible Key to Success* in 1996 to his book *Intellectual Capital: The New Wealth of Organizations* (Currency) provide a thoughtful and comprehensive look at the best practices in the knowledge management area.

Buying brains and acquiring competences

The *HBR* article, "The Hollow Corporation," highlighted the poor performance of mergers and acquisitions as a way to acquire valuable competences and talent. A more recent multinetwork example would be eBay's $2.6 billion acquisition of Skype in September of 2005. The potential for a very powerful multinetwork multiplier effect could explain this unusually high valuation. However, the implementation challenges of creating a seamless click-to-call advertising-based system, as well as Skype founders' focus on starting up their new venture Joost, likely hindered the realization of that potential. eBay just took a $900 million write-down after two years. At the same time, Niklas Zennström, Skype's chief executive and cofounder, resigned.

Valuable intangible assets

Often brand, reputation, relationships, technology, and goodwill are included in a list of intangible assets. See *Mobilizing Invisible Assets* (Harvard University Press) by Hiroyuki Itami and Thomas Roehl and *Working Knowledge* (Harvard Business School Press) by Thomas Davenport and Laurence Prusak. This list includes a number of valuable, intangible assets that are generated specifically by online and Web 2.0 businesses and discussed in this book—network effects, buzz or viral marketing and distribution, business models, ecosystems, and momentum.

Syndication and online publishing

Syndication is a business model well understood in the publishing and media world. Thanks to a lunch arranged by David Irons, then director of communications at Haas and

later, cofounder of Ascribe, an online research news feed, Assistant Dean Paul Grabowicz at the U.C. Berkeley Graduate School of Journalism, and I developed and cotaught an interdisciplinary course titled New Media Business Models. (*American Journal Review*, Dec. 2000) We brought in exciting speakers and thought leaders in the converging space of new media, digital economics, and online publishing (Haas NewsWire April 5, 1999), including Kevin Kelley (*New Rules for the New Economy*) and Hal Varian (*Information Rules*), Kara Swisher (*Wall Street Journal*), John Battelle (*The Search*). Many others helped initiate the New Media program at Berkeley, including Patricia Dunn (then vice chairman, Barclays Global Investors), John Gage at Sun, Dan Gillmor (then of SJ Mercury, now of Grassroots Media and author of *We the Media: Grassroots Journalism By the People, For the People* [O'Reilly]), and Paul Saffo at the Institute of the Future.

Online Syndication

See the outstanding *HBR* article, "Syndication: The Emerging Model for Business in the Internet Era," written by Kevin Werbach in 2000, now a professor at Wharton and founder of the SuperNova conferences. The article was prescient in highlighting the business and strategic implications of syndication business models on the Web, but it was written well before the advent of Web 2.0 technologies and business models, including RSS, blogging, podcasting, videostreaming, social networks, and viral distribution via software as a service.

Software as a Service and Web Services

John Hagel III and John Seely Brown's *Out of the Box: Strategies for Achieving Profits Today & Growth Tomorrow Through Web Services* (Harvard Business School Press). *Harvard Management Update* article "Web Services: Technology as a Catalyst for Strategic Thinking." Another perspective on SaaS is offered Andrew McAfee's *MIT Sloan Management Review (SMR)* article "Will Web Services Really Transform Collaboration?," as well as his following article "Enterprise 2.0: The Dawn of Emergent Collaboration." Background and overview of the implications for the industry are in the HBS case, *The Global Software Industry in 2006*.

Salesforce.com

See the HBS case *Oracle vs. Salesforce.com*.

IBM and Dynamic Capabilities

See the *CMR* article "Dynamic Capabilities at IBM: Driving Strategy into Action," coauthored by IBM's head of strategy, Bruce Herrald. Also see the HBS case, *Emerging Business Opportunities at IBM (A)*; Louis Gerstner's book *Who Says Elephants Can't Dance?: Leading a Great enterprise through Dramatic Change (Collins)*; and *Wikinomics: How Mass Collaboration Changes Everything* (Portfolio Hardcover) by Don Tapscott and Anthony Williams.

Global knowledge economy and the flat world

See the following books: *The World Is Flat: A Brief History of the Twenty-first Century* (Farrar, Straus and Giroux) by Thomas Friedman; *Six Billion Minds: Managing Outsourcing in the Global Knowledge Economy* (Aspatore Books) by Mark Minevich et al.; *India and the Knowledge Economy: Leveraging Strengths and Opportunities* (World Bank Publications) by Carl Dahlman and Anuja Utz; and *Bottom of the Pyramid* (Wharton School Publishing) by CK Prahalad.

Amazon: Giving Away the Store

This is the title of an article in *Business 2.0* that made me see that Amazon was an ideal example of competence syndication. More details about the development of the Amazon infrastructure and system are in the 2000 HBS case *Amazon.com: Exploiting the Value of Digital Business Infrastructure*.

Give to get strategy

Give something away for free but do it in such a way that it ends up expanding the business or producing cross-network effects in an n-sided market, in which one group will be willing to pay more.

Competence Mashups

This is the title of a *BusinessWeek* article—tinker toys connection of different proprietary databases. My emphasis is first on the localized and real-time know-how that is embedded in the data that is collected, which makes it valuable; and sec-

ond, on the APIs, or sections of interface code, that allow outsiders a view of how the data and information is architected within a company's system.

Chapter 5

Schumpeter's creative winds of destruction

Joseph Schumpeter, an Austrian economist, wrote in 1932 about the "creative gales of destruction" and described them as clusters of innovation that could change the whole economy along with social and cultural practices.

Disruptive innovation

Christensen characterizes disruptive innovation as primarily disruptive technologies in his best-selling book: *The Innovator's Dilemma: The Revolutionary Book that Will Change the Way You Do Business* (Collins). Also see the *HBR* article "Disruptive Technologies: Catching the Wave." This is somewhat unexpected when contrasted to the classic approaches in the management of innovation literature (for example Utterback, *Mastering the Dynamics of Innovation* [Harvard Business School Press] or Foster's *Innovation: The Attacker's Advantage* [Simon & Schuster]) that looked at innovation rates and their interdependencies in products and/or related production processes. A focus on strictly disruptive technologies, while critical for industrial hardware-oriented industries, would seem to give short shrift to many significant business innovations in solutions, services, organizations, processes, and customer-focused businesses. One book that provides a collection of classic management of innovation and technology papers on this topic is Tushman and Anderson (eds.) *Managing Strategic Innovation and Change: A Collection of Readings* (Oxford University Press).

For example when Andy Grove, the well-known cofounder and chairman of Intel, shares his own list of strategic inflection points or industry discontinuities in his book *Only the Paranoid Survive* (Currency), it mainly consists of business, organizational, or system-wide innovations such as container shipping

that revolutionized the logistics, physical goods distribution and transportation industries. His list also contains lean manufacturing and just-in-time supply chains that completely shifted the cost structure, timing, organization, and interactions of man, machine, and inventory in the modern factory (rather than changing the technologies of the capital equipment purchased). A classic worth reading on this subject is *Winning through Innovation: A Practical Guide to Leading Organizational Change and Renewal* (Harvard Business School Press), authored by Charles O'Reilly and Michael Tushman.

Disruptive business models

I like to use the inclusive term *disruptive business models* to describe business, organizational, and system-wide innovations that cause strategic inflection points or industry discontinuities. In Chapter 2, we saw in the case of Web 2.0 that collective user value and n-sided markets in digital networked markets can shift cost structures and generate increasing returns and demand side economies. Digital and online networked technologies are creating an increasingly connected online mobile broadband user base, where different business models and growth patterns are emerging.

Flat world and the global knowledge economy

Thomas Friedman's book, *The World Is Flat*, was the talk of the World Economic Forum at Davos in 2006, echoing the concern of CEOs, Wall Street, policymakers, and political figures that the balance of economic power was shifting toward the emerging geographies of BRIC: Brazil, Russia, India, and China. The term "flat world" emphasized the increasing connectedness and speed of communication available through technology, shortcutting geographic distance and time. In a previous endnote in the chapter on global competence syndication, I mentioned the impact of this free flow and spillover of knowledge for the global knowledge economy. Friedman also highlights the importance of individual uploaders and Web 2.0 technologies like blogging, podcasting, and Wikipedia in bringing individual local experiences available globally.

Peer-to-peer architecture and Skype

Many people heard about peer-to-peer file-sharing for the first time in connection with Napster, which used a distributed file-sharing system and peer-to-peer web connections to allow online, real-time, and ad hoc downloading of music files from one node or peer's hard drive to another's. See the book The *Starfish and the Spider* for an interesting account. Unfortunately, the legal battles that ensued around this particular application may have given most people an unnecessarily negative impression of the technology of peer-to-peer architectures and file-sharing, intrinsically a very powerful and elegant solution to large-scale computing problems, ad hoc point-to-point, or multi-hop connectivity and system resource management.

The founders of Kazaa developed a very powerful peer-to-peer architecture for ad hoc distribution of digital bits from one connected and identified node to another—this system was considered illegal in the music-sharing context. However, it was worth $2.7 billion in market valuation to eBay when they instead applied their architecture (with the company name of Skype) to the VoIP telephone industry. In this system, a user's laptop can become the routing hub or path for her own international calling rolodex, saving capital investment in infrastructure, just like SETI or grid computing applications.

Incremental innovation

Incremental innovation is typically a continuous and competence-enhancing improvement along an existing technology trajectory or between generations of related products and services.

Radical innovation

Radical innovation is typically a discontinuous and competence-destroying introduction of a breakthrough or entirely novel product, system, or business model requiring greater risk and considerable change in basic technologies, processes, and organization. However, the advantage is that radical innovators break past the mainstream industry and existing paradigms. See *Blue Ocean Strategy: How to Create Uncontested*

Market Space and Make Competition Irrelevant (Harvard Business School Press) by Chan Kim and Renée Mauborgne.

Architectural innovation

See the article "Architectural Innovation: The Reconfiguration of Existing Product Technologies and The Failure of Established Firms," by Rebecca Henderson with Kim Clark, in *Administrative Science Quarterly*. The article says "Architectural innovation is the reconfiguration of an established system to link together existing components in a new way. The important point is that the core design concept behind each component—and the associated scientific and engineering knowledge—remain the same."

Competitive or collaborative innovation, Co-opetition

The historical examples of the videocassette recorder industry and the Citibank ATM come from the book *Co-opetition: A Revolutionary Mindset ThaCombines Competition and Cooperation: The Game Theory Strategy That's Changing the Game of Business* (Currency) by Adam Brandenburger and Barry Nalebuff.

User-led or democratized innovation

See MIT Professor Eric Von Hippel's book, *Democratizing Innovation* (The MIT Press) and his earlier classic *The Sources of Innovation* (The Oxford University Press).

Crowdsourcing or crowdcatching

The book *Wikinomics* uses Wikipedia as the classic example of mass collaboration or crowdsourcing. Also see the *HBR* article "Connect and Develop: Inside Procter & Gamble's New Model of Innovation" and the *SMR* article, "The New Principles of a Swarm Business" for more good examples.

Open source, ecosystem and platform innovation

Henry Chesbrough's most recent book, *Open Business Models: How to Thrive in the New Innovation Landscape* and Strategy and Innovation article, "The New Business Logic of Open Innovation. Annabelle Gawer and Michael Cusumano's book *Platform Leadership: How Intel, Microsoft and Cisco Drive Industry Innovation*. HBS note, "Platform-Mediated Networks: Definitions and Core Concepts."

The iPod as a mobile platform for entertainment versus communication

See the following HBS cases: *The Music Industry and the Internet*, its sequel, *Update: The Music Industry in 2006*, *Apple Computer, Inc: iPod and iTunes*; *and iPod vs. Cell Phone: A Mobile Music Revolution*.

Platform innovation ecosystem #4

User-provided metadata and Berkeley-based but internationally known GraceNotes CDDB technology and open software standards—don't have to be an IBM, RedHat, or Linux to co-create value.

Click and mortar, brick and click, offline-online

These are different terms used to describe hybrid offline-online partnerships. The *HBR* article "Get the Right Mix of Bricks and Clicks" by Ranjay Gulati and Jason Garino, written before Web 2.0, provides an early overview.

Jajah and VoIP

See the *HBR* article "Using VoIP to Compete." Presentation by Michel Veys, COO of Jajah for the Chalmers-Berkeley Program.

iPhone—Wifi compatibility

The iPhone and its Wifi compatibility has implications on the open standards use of the iPhone browser and the emergence of open developer and application ecosystems. It also might explain the early exclusive partnership with AT&T—which performed a significant amount of technology development—but AT&T might not enjoy exclusivity for long.