

Work on Networks

A GBN Tour by Clay Shirky

A GBN Report

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Networks have transformed business in the last decade. The explosion in communications networks, and the subsequent transformation of the social, is obvious. Knowing how to extract value from those changes, however, is much harder.

Networks themselves are not new, and formal thinking about networks is not new either. Social networks are an essential fact of human life, referenced since at least the Book of Isaiah. More recently, network theory has been a theoretical discipline since the 1700s, and the communications networks we rely on have been part of modern culture since the telegraph.

Networks are also not replacing hierarchies. For 10 years, we've been seeing the same dippy PowerPoint slide:

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| <ul style="list-style-type: none">• Then: Hierarchical Org<ul style="list-style-type: none">▪ Stupid▪ Slow▪ Bad, bad, bad | <ul style="list-style-type: none">• Now: Networked Org<ul style="list-style-type: none">▪ Nimble!▪ Co-opetition!▪ It's the future! |
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Despite a decade of this sort of hectoring, hierarchy remains an essential management tool.

Here's what *has* changed: We understand networks better—a lot better—than we used to, and we have much better tools for manipulating them. We are living in a Golden Age of network theory, where sociology, math, computer science, and software engineering are all combining to allow the average user to visualize, understand, and, most importantly, rely on the social and business networks that are part of their lives.

We have always had networks, and they have always existed alongside hierarchies, but they have been implicit and hard to see—it is much harder to draw a network map than an org chart. Not surprisingly, people rely on those parts of their lives that they can understand and predict. Networks of human relations, whether in a social or business context, have failed both of those tests until recently.

Much has changed and much is still changing in the way we understand networks. In particular, thanks to work in the last five to 10 years, we have a much deeper understanding of the way human networks work and a much greater ability to visualize those networks. We can finally begin to predict how networks will behave over time.

On this foundation of theoretical work, people are now building tools for gathering information from networks (both overtly and covertly), for showing the results of that information in near real-time, and for helping users manage those networks to their benefit. Companies like Friendster (www.friendster.com), Visible Path (www.visiblepath.com), MeetUp (www.meetup.com), and SocialText (www.socialtext.com) have all taken the theoretical work on social networks and are turning it into tools that the average user can adopt with ease.

Below is a highly opinionated list of books, articles, and websites that illuminate the background and workings of this particular Golden Age.

Background: 1960s—Present

1960s: The change we are talking about started with the ability to make crisp assertions about squishy things like networks, and the granddaddy of those assertions is Stanley Milgram's famous conclusion that we are linked to one another through six degrees of separation. Milgram's conclusion was first published in

1967 in a brief article in *Psychology Today* entitled "The Small World Problem." However, Milgram's original experiment—give letters to people in Nebraska destined for a stranger in Boston, then watch whether and how those letters get passed on—suffered from methodological problems, and raised more questions than it answered. It would be 40 years, in fact, before we understood how such social networks worked. (See works by Duncan Watts below.)

1970s: It was Mark Granovetter's 1974 work, *Getting a Job*, that marked the dawn of truly applicable work on social network dynamics. Granovetter started with a simple question: How do people find jobs? In conducting almost 300 interviews, he discovered that of the many jobs people found by word of mouth, the majority came not from family or close friends but from more distant relatives or acquaintances, precisely because those people had access to information the jobseeker didn't. This result, summarized as "the strength of weak ties," inaugurated much of the excitement around describing the way wider social networks create value. Granovetter's work was part of the inspiration for recent networking tools like Tribe.net (www.tribe.net) and Friendster. (He is now at Stanford, working on a project to map the social networks of Silicon Valley.)

1980s: Etienne Wenger, pursuing the idea that, in his words, human knowing is fundamentally a social act, drew a connection between knowledge, community, learning, and identity. The result was *Communities of Practice*, which describes informal networks of individuals engaged in similar activities who pass along tricks, tips, and lore. As John Seely Brown and Paul Duguid of Xerox PARC later showed (see next section), these communities of practice can be essential to business practices, and accidental disruptions of such communities, even for the best of reasons, can be damaging.

2000: *The Tipping Point*

Early 2000 saw the publication of three seminal books in this area, covering the explosion of work done in the '90s. John Seely Brown and Paul Duguid published *The Social Life of Information*, a fusion of their work on the way information exists in human context. Particularly interesting is their fieldwork on Xerox repair people, who were supposed to be solo operators but were in fact gathering daily for breakfast, both for camaraderie and to trade notes. These breakfasts turned out to be an essential but little-understood business asset for Xerox.

Also in that year, Robert Putnam published his magnum opus, *Bowling Alone*, which chronicled the decades-long decline in semiformal social structures such as bowling leagues. Even more than Wenger's work, *Bowling Alone* spread the idea that social fabric is real and valuable, and can be damaged by incautious or unthinking action. It was also responsible for moving the phrase "social capital" out of academic circles and into general use, and inspired the founding of MeetUp. (See reference to the Dean campaign below.)

Finally, of course, there was *The Tipping Point*, Malcolm Gladwell's look at fads and social epidemics and their relevance for business. Though the book goes into less detail about the mechanics of human networks than the other works listed here, it introduced the idea of "connectors"—those people whose Rolodexes are not just bigger than yours or mine but bigger than yours and mine put together. Duncan Watts's work on Milgram's small-world problem and Barabási's work on the distribution of links in networks of all kinds (both described below) made the existence of such connectors predictable and trackable.

Three Scientists

Brown, Duguid, Putnam, and Gladwell had all shown that work on social networks could find a wide audience—especially among business readers, who were increasingly recognizing the role networks played in their dealings with employees, suppliers, and customers.

Shortly afterward, general interest books by scientists who were working on understanding different aspects of social networks began to appear. In 2002, Albert-László Barabási of Notre Dame published [Linked](#), which describes his work on so-called power law distributions, the wildly unequal shape that describes many forms of social distribution. Word frequency falls in a power law pattern, with a small number of high frequency words (I, of, the), a moderate number of common words (book, cat, cup), and a huge number of low frequency words (peripatetic, hypognathous). So do things like the distribution of wealth (a few hyper-wealthy individuals; a long, flat tail of average earners) or business and social contacts (Gladwell's connectors vs. the rest of us). Barabási demonstrates how and why power law distributions arise in networks.

Duncan Watts followed in 2003 with [Six Degrees](#), which explained *why* power laws arise in social networks. Watts did groundbreaking work on small-world networks, the very form of social networking that helped Milgram's test subjects route a letter from friend to friend through six degrees. Watts tied together three threads: (1) social networks are loosely woven, and get their density and resilience from a small number of highly connected nodes (connectors); (2) if the nodes in a small-world network are sorted by degree of connectivity, they fall into a power law distribution; and (3) networks that have this shape can grow very large and still connect any two nodes within only a few degrees of separation.

See also Watts's recent piece in *Science* (8 August 2003) on his replication of the original Milgram/six degrees experiment, this time via email. Watts discovered that most chains do indeed complete in about six degrees, but also found that most messages never reached their destination. The problem turns out to be not how we are connected, but how best to use those connections.

Finally, the prolific Bernardo Huberman of Hewlett-Packard continues to advance our understanding of network effects. Huberman has gathered together an astonishingly talented group of researchers in his information dynamics research group, and while this group has not produced a book with the explanatory sweep of *Linked* or *Six Degrees*, their publications are at the forefront of linking network science and business concerns. Recent publications of interest to the business community from the information dynamics page at HP (<http://www.hpl.hp.com/shl/>) are "Information Dynamics in the Networked World," a review of studies on the way information moves through social networks via email, and "The Dynamics of Reputations," a study of the way the reputation of firms can grow or decay. Of particular interest in the latter study is the finding that reputational collapse is much swifter when public information is involved. (These publications are first and foremost academic reports of findings, and the math can get quite dense, but the information dynamics team does a good job of summarizing their results in English.)

Revolution at Home and Abroad

When something is really a revolution, it pervades numerous spheres simultaneously. In this case, the simultaneous adoption of network principles by the U.S. military and club kids—not groups that are often in sync—suggests the depth of this pattern.

On the military front, a loosely affiliated group in the defense and intelligence community has been pushing for a change from the Napoleonic "command and control/mass and attack" strategy to one that relies on many small units that operate with a looser degree of coordination and a higher degree of autonomy. John Arquilla, author of [Networks and Netwars](#), has been at the forefront of this change in tactics, documenting the ways in which the U.S.'s enemies have adopted networked forms of organization and tactics (especially, of course, Al Qaeda), and has been instrumental in helping shape our response. The reliance on Special Forces units in Afghanistan and Iraq is part of the larger and now congressionally mandated shift to "network-centric" warfare.

Meanwhile, Howard Rheingold has documented the emergence of [Smart Mobs](#). Rheingold documents everything from the way teenagers now decide what club to descend upon via SMS (short messaging service) to the spontaneous and decentralized communications that characterized the anti-WTO protests and

the toppling of Estrada's government in the Philippines. The thing all of his examples have in common is that loosely affiliated groups, relying on decentralized and real-time coordination, can accomplish what used to take significant organizational resources.

Recent Essays

In addition to the books and papers listed above, there are a number of people working on making our new understanding of networks practical and actionable. Recent essays and articles that are worth looking at for a clue about what is possible include:

Eric von Hippel's research at MIT into user innovation networks
(<http://web.mit.edu/evhippel/www/UserInnovNetworksMgtSci.pdf>)

Dan Gillmor on Howard Dean's use of social networks in his presidential campaign
(<http://weblog.siliconvalley.com/column/dangillmor/archives/001267.shtml>)

Clay Shirky's experiments with augmenting real-world meetings with an online component
(http://www.openp2p.com/pub/a/p2p/2002/12/26/inroom_chat.html)

Valdis Krebs's study of what Amazon book-buying patterns tell us about political networks on the right and left (<http://www.orgnet.com/leftright.html>). It's no surprise that the two political camps live in parallel and almost non-overlapping universes, at least as regards their reading matter.

Watch This Space

We are just getting started. The science that allows us to understand, describe, visualize, and manipulate our networks (and those of our enemies) is only just crossing from the theoretical to the practical. Good sites to watch for ongoing coverage of the changes include:

Hewlett-Packard's information dynamics unit

Eric von Hippel's research (<http://web.mit.edu/evhippel/www/>, both "online papers" and "current research")

The Many2Many weblog (<http://corante.com/many/>) run by a group of researchers and entrepreneurs who work on social software

Howard Rheingold's Smart Mobs weblog (<http://www.smartmobs.com/>)

Also, if you want to see a kind of proxy fight involving network strategies, watch the Recording Industry Association of America's battle with file-sharing networks. Many commentators listed here, especially Gladwell, Barabási, Watts, and Arquilla, have noted that the way to attack decentralized networks is to go after their most connected nodes—exactly the strategy the RIAA has adopted in its current round of suits. The countermove by the file-sharing networks will now be to raise the membranes around file-sharing groups, clustering together users who trust one another and raising barriers (in practice, strong digital encryption) to observation from the outside.

[Clay Shirky](#), a GBN Network member, is a consultant, teacher, and writer on the social, cultural, and economic effects of Internet technologies, an adjunct professor at NYU's graduate Interactive Telecommunications Program, and the former vice president of the Electronic Frontier Foundation's New York chapter. He played a key role in designing and shaping the "Business of Social Networks" WorldView meeting.

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