

## Theories of Media Evolution

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*Those who ignore history are doomed to repeat it.*  
—George Santayana

*History does not repeat, but it does rhyme.*  
—Mark Twain

Our muse for this volume might well be the two-faced god Janus of the Roman pantheon who famously looked both forward and backward, the patron of beginnings, transitions, and new plantings. His name is the linguistic root for the month we call January. We will make the case here that the ongoing digital revolution in present-day media technology represents an important new beginning in public life and is likely to have a fundamental influence on how individuals, social groups, and societies define themselves, how individuals come to know the world around them, and whether further generations succeed in sustaining an energetic public sphere and open marketplace of ideas. If these technical transitions offer us an opportunity to collectively construct institutions and digital systems that best serve our shared (although frequently contested) ideals of the public good, how might we proceed most thoughtfully, realistically, and successfully? Our muse suggests a very careful look at the recent past. If we want to understand how the Internet is likely to evolve, perhaps we should take a long, hard look at the bizarre evolution of the infrastructures and institutions of the past century—newspapers, telephony, movies, radio, television, satellite-based cable TV, early digital networks.

Bizarre? That is a rather strong descriptive term to try to capture the essence of entire century of technical, economic, institutional, and cultural history. The term implies a notion of something freakishly out of the ordinary, unexpected, weird, not according to plan. At first glance, such a characterization would seem to be a poor match for what we know of newspapers, radio, and TV—humdrum, predictable, taken-for-granted elements of our daily lives. The last two centuries trace a now celebrated succession of genius inventors. Samuel F. B. Morse invented the telegraph, Alexander Graham Bell the telephone, Edison movies, Marconi radio, Farnsworth TV. These heroic visionaries knew what they were doing and their visions changed our lives. Yes?

Well, not exactly. As we will see in the pages ahead, most of those we now find it convenient to celebrate as genius inventors had notions about what they were building that turned out to be at some variance from what eventually evolved into working technologies and institutions of mass communication. When we take the time to look back carefully, we come to understand that it could have been otherwise, sometimes dramatically so. What we assume to be an inevitable technical progression is actually the result of accidental sequences of events and diverse political battles won and lost. In other words—bizarre happenstance.

It could have been otherwise. What we know as newspapers, radio, and television were socially constructed, not technologically determined by the nature of printing and of electromagnetic transmission through the air. That lesson will become a key element of our look forward to a world defined by ubiquitous digital broadband nodes and networks. The general term for our approach to these curiously repeating patterns is the *social construction of technology* (frequently abbreviated SCOT), a model of historical analysis popularized by Bijker, Hughes, and Pinch in their influential 1987 volume on the technological innovation. SCOT is a theoretical perspective, an overarching label for a series of more focused theories about the interaction of cultural presumptions, the radical new ideas of innovators and the constraints exerted by entrenched interests and political economy of technical change. We will introduce each of these theories briefly in this introductory chapter and then they will be put to work in the chapters that follow.

Bijker and colleagues reviewed a broad array of technologies and historical transitions. Here we will focus on seven dominant modes of communication, primarily mass communication that have in many ways come to define the character of American industrial society over the last two centuries, as summarized in figure 1. We have assigned each of

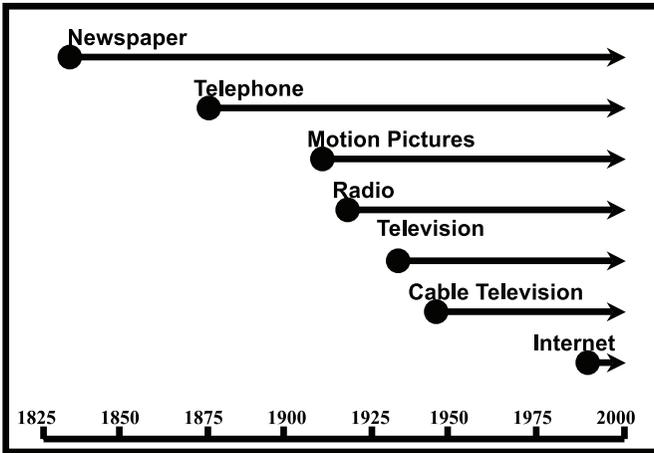


Fig. 1. Timeline of American Media

these media an official birthday, although as we will see shortly there is typically ambiguity, controversy, and a delay of varying numbers of years between technical invention and social utilization. We shall see that the history of innovation brings to light many examples of considerable confusion, false starts, and conflict.

#### A Succession of the New Media of Their Time

The steam-driven cylindrical rotary press made the modern mass-circulation newspaper possible. So although we celebrate Gutenberg's innovations of the fifteenth century, we will designate 1833 as the historical birth year of the modern newspaper because of Richard Hoe's invention of the modern rotary press and Benjamin Day's dramatic decision to sell the *New York Sun* for only a penny, making it economically available to a mass readership. For telephony we use 1876, the year of Alexander Graham Bell's patent application. In the early days of telephony many anticipated its use as a broadcast public-address style technology for concerts and speeches, a social definition that would strike most modern telephone customers as quaint. It would take three-quarters of a century before in-home telephony started to reach near universal penetration. The technology of motion picture photography and projection was developed by the Lumière brothers and Thomas Edison in the 1890s, but to signal the birth of commercial motion pictures we point to the

year 1913, when the first commercial motion picture venue opened in the United States and movies moved from the nickelodeon arcade to the theater.

KDKA operated by Westinghouse in Pittsburgh is credited with being the first commercial radio station with regularly scheduled broadcasts in 1920. The corresponding date for commercial television was 1941, when NBC and CBS commenced limited wartime television broadcasts in New York. Cable, born originally as CATV, for *community antenna TV*, was first tested in the mountains near Philadelphia in 1948. It would take almost thirty years for cable to move from retransmitting a few regional TV stations to multiple channels of independent television programming. And finally, we mark the birth of the modern Web with the release of the first user-friendly web browser at the University of Illinois in 1993. The Mosaic browser built on the recent ideas of Tim Berners-Lee and, of course, the fundamental technologies of the Internet Protocol invented three decades earlier for military purposes. The seven chapters following this introduction look through a variety of theoretical lenses to review the overlapping histories and futures of these media, and the two subsequent chapters address public policy questions that arise as each of these media confront an increasingly digital world.

Figure 1 arrays each of these media in a straightforward timeline from their designated birth years. It is an uncomplicated diagram because for the time span of each medium, the basic technology, the stylized content, and the social definition of appropriate media use was a largely unchanged and consistent historical arc. Newspapers shifted from a flirtation with dramatically yellow journalism to the modern principles of professional journalistic practice at the turn of the century. Broadcast telephony never took off. Movies added sound in 1926. Radio migrated from the living room to the bedroom, kitchen, and car in response to competition from television in the 1950s. But the basic social definition of reading a newspaper or listening to radio or watching television remained unchanged.

### When Old Technologies Meet New

Figure 1 depicts each medium as an arrow moving forward into the twenty-first century, but therein lies a central puzzle and a principal motivation for this volume. Many observers are predicting that these historically defined media will converge into a single digital medium—the medium we now refer to as the Internet or simply the Web. We see the

outlines of this process in the multipurpose portable devices like the iPhone or Blackberry that function as telephones, cameras, web browsers, and audio and video players. Skeptics have raised doubts about this convergence, pointing out that newspapers survived the advent of radio news in the 1920s and movies survived competition from television. But this technological revolution may represent a different historical case because the Internet does not simply compete with its predecessors, it subsumes them. Is such a process really under way? Will it represent a collective opportunity for us to review the architecture of public communication to ensure that it best serves the public interest? The tradition of American mass communication is famously an intersection of the civil public commons and the realm of advertising and private enterprise. Will Internet radio and Internet newspapers simply mimic their commercial predecessors or develop new voices and functions perhaps derived from social networking web sites? Our strategy to assess these important questions is to draw on the recent past and exploit the best standing hypotheses and theories of technological evolution the literature provides us.

This first chapter will introduce the toolkit of concepts and theories the authors in this volume variously put to work. Toynbee famously chastised historiography as just the documentation of “one damned thing after another.” We aspire to a somewhat higher level of organization. A frequent strategy in organizing these compelling tales is the thematic of human initiative pitted against powerful forces perceiving novelty as threat. Another strategic approach to theorizing is to focus on structural factors and systemic dynamics. All of the chapters confront the issue of technology, especially critical points in technical evolution. These are studies of coevolving media institutions, human initiative, technological capacities, and a changing society. I hasten to point out that none of the authors subscribes to any variant of technological determinism. Unfortunately, this specter of ill-considered causal attribution continues to plague this field of scholarly inquiry. Those of us who study changing technologies in historical context have grown accustomed to addressing this unfortunate and nearly inevitable epithet in most scholarly forums. None of the authors here succumb to such technological monism. None diminish the importance of human agency or the dynamic two-way interaction of technical design and cultural perspective. Most would agree with Castells’s dictum: “Of course, technology does not determine society” (1996, 3).

The physical properties of alternative technical systems, however, do

make a difference. They prove to be variously constraining and empowering of diverse human activities. Centralized printing and publishing is by its nature prone to one-way communication and is subject to censorship. Communication via the Internet is inherently bidirectional, decentralized, and less easily monitored and censored. But to constrain or facilitate is not to determine. Ignoring the character of technological systems is as shortsighted as unthinking deterministic attribution. The pages ahead will address the interaction of technical capacity and cultural initiative at length, not as a deterministic process but rather as a form of coevolution (Durham 1991; Garud and Karnøe 2001). As appropriate, authors use such terminologies as a *technological affordance* or *socially constructed use* to capture this technological-cultural interaction (Hutchby 2001; Bijker, Hughes, and Pinch 1987). In some more philosophically oriented analyses of technical history, the character and directionality of constraining forces is more central to the analysis. One such tradition of scholarship is *actor network theory*, frequently abbreviated ANT (Latour 1987). Latour and colleagues Michel Callon and John Law may have been reacting in part to the technological determinism critique and wanted to bring technical properties “back in” to theorizing without ignoring the critically important elements of social construction. Another tradition follows from Anthony Giddens’s concept of *structuration* (1984). Giddens draws attention to the ironic fact that individual agents are both constrained by social structures and, through their routine behavior, powerfully reconstitute these structures. Accordingly, we come to understand that the power of the traditional mass media relies on the fact of massive public habitual reliance more than any fundamental technical capacities. As it turns out, none of our authors use Latour’s or Giddens’s work formally and explicitly, but the perspectives they have advocated and their concern about interactive causal connections inform the work in each of these chapters.

### Heroes and Villains

The heroes of these stories of media evolution as they are most often told are those who support innovation, competition, a vibrant and inclusive public sphere, and an open marketplace of ideas. These include inventors, innovators, investors, insightful public servants, policy advocates, academic researchers, philosophers, and risk-taking entrepreneurs. The requisite villains, as these accounts progress, are the skeptical conservative forces, energetically protecting their profit margins, threatened by

and resistant to the prospect of change in traditional patterns of public communication. The distinction, however, is far from clear-cut. The leading actors seldom conveniently identify themselves with white or black hats. Some established (and profitable) institutions provide important functions very much worth sustaining. One thinks of the importance of competitive and self-sustaining independent journalism, what we have come to label the “fourth estate” in modern liberal industrial democracies (Hallin and Mancini 2004). It is far from clear how independent professional journalism will sustain itself if the advertising-driven ink-on-paper news business model fails. One thinks also of numerous institutions associated with sustaining community arts and indigenous and classical arts and literatures. And some innovators have designs on constraining diversity, exploiting stereotypes and extracting oligopolistic profits.

We often confront, as well, two other forms of potentially self-serving villainy that may transcend the behavior of individual actors. The questions these behaviors raise are fundamental to the field of political economy—the study of the border between political and economic institutions. The first is the prospect of the excesses of an unconstrained and ill-behaved marketplace. The second is the prospect of an equivalently unconstrained and repressive political regime. Public communication and active mass media lie at the core of a successful polity. Governments regulate spectrum, rules for intellectual property protection, limitations on public speech, electoral processes, media ownership, and guidelines for individual privacy. The media marketplace, much more than the market for, say, golf balls or cardboard boxes, is wholly permeated with political and regulatory involvement. Historically, it might be modeled as a “tipping” or “slippery slope” problem—once big business or big government becomes all-powerful, the prospect of using that power to preclude any challenge to dominance is irresistibly seductive. Totalitarian state systems that deflect criticism from citizens and confine the potential of an adversarial and independent press represent one troubling exemplar (Pool 1973). Correspondingly dominant capitalist ideology and unchallenged manipulation of political institutions represents another, one that continues to attract a great deal of attention in the tradition of critical theory (Habermas 1989; Schiller 1989; Bagdikian 2004).

#### A Working Toolkit of Theoretical Constructs: First the Heroic Innovators

Stories require heroes. Histories too. In the many thousands of generations before the invention of the ultimate medium of communication—

the written word—generations passed their accumulated wisdom to their successors in an easily remembered format, the narrative. Stories of heroes and dragons and maidens would elevate the accomplishments of the protagonist rallying against difficult odds as a socially desired model for behavior, with partially remembered facts and useful fictions inevitably intertwined. Why, then, should we be surprised that one prominent approach to recording media history and understanding innovation could be characterized as the *heroic school*?

Behind every successful innovation in human endeavor is likely a champion, an articulate visionary, an inventor perhaps at the margins of the social institutions of the day, or contrastingly, a powerful player who seizes upon an innovation as a means to a self-serving end. Most analysts in the tradition of such historiography do not actually use the word *hero*. Christensen (1997), among others, draws attention to the *innovation champion model*. Garud and Karnøe (2001) label heroic innovation as *mindful deviation*, but the analytic meaning is fundamentally the same. Both theories celebrate the willful capacity of socially situated individuals who have each in their own way been hit on the head by a falling apple and have responded appropriately, thoughtfully, and probably creatively. Garud and Karnøe's reading of the literature leads them to critique *path dependency* models as unnecessarily deterministic and incomplete. They prefer to emphasize *path creation*, noting that, of course, directions of innovation are limited by historical circumstances, by current technical capacities, and indeed by the previous choices that bias later ones. But the key observation is that mindful innovators think about and actively respond to these constraints. Their behavior represents an interesting twist on random mutation in the Darwinian tradition. Traditionally the mutation either enhances or diminishes survival odds of the organism in a given ecological niche. In Garud and Karnøe's model, the mindful observer reacts to potential of the mutation by working to change the character of the ecological niche itself or proactively finding a new niche for which the mutation is especially useful.

A variation of the heroic model that draws the attention of our chapter authors is the notion of a *founding myth*, the post hoc creation of a heroic narrative to explain the success of a technology or company. David Sarnoff, RCA's famous and charismatic CEO, for example, tells the story of how he foresaw radio as a magic music box in every household rather than the applications in marine telegraphy that occupied its early developers at the Marconi Company. There is some controversy about whether he actually authored—as he claimed—the famous 1916

music box memorandum that imagined radio in every home, but one can understand why such a memo is useful to the heroic narrative. A variant of founding mythology is *visionary rhetoric*, the use of slogans and catchphrases to capture the promise of various innovations.

*Theorizing the Counterpoint to Heroism*

And heroes require dragons. How could a satisfying narrative be complete without the requisite counterpoint to innovative heroism—the establishment, the status quo, those interests perhaps threatened by new ways of doing things? Sarnoff, who had worked his way up the chain of command from telegraph operator and visionary to leader of RCA and NBC, became himself the counterpoint to visionary inventor Philo Farnsworth, whose television technology threatened the RCA radio empire, whose leaders had plans of their own for television. Perhaps the most formalized model of counterpoint dynamics is Brian Winston's *law of the suppression of radical potential* (1986, 1998). In his analysis, established institutions alternatively delay the diffusion of competitive technologies or influence how new technologies are structured so they are less threatening to established institutions and social norms.

A close theoretical relation to Winston's suppression law is the idea, already noted, of path dependency. In the broadest sense, this perspective is simply a restatement of the less than controversial observation that "history matters." But in the tradition of technological historical analysis it has special meaning in the sense of technical "lock in" associated with processes of standardization and technical interoperability (Schmidt and Werle 1998; Shapiro and Varian 1998). Returns to scale often reward early technological initiatives with a competitive advantage not easily overcome. The classic example, of course, is the QWERTY keyboard, originally designed to prevent adjacent typewriter keys from jamming, which now provides a standard that precludes layouts more efficient and appropriate for the computer age (David 1985). Hughes (1987) and colleagues in the SCOT tradition sometimes use the analytic term *closure* to characterize largely the same phenomenon—the stage of technical development when the system architecture of technology and socially accepted common use become fixed and resistant to further development. One element of closure that draws more on cultural rather than technical factors is the *resilience of interpretive schemes*, the taken-for-granted and self-reinforcing patterns of professional practice and social definition Bourdieu often referred to as *habitus* (1991, 1993).

Notions of path dependency in the domain of media institutions have a somewhat different emphasis, focusing on the accumulation of political and economic power rather than technical lock-in, although both phenomena are in evidence. My personal favorite in historical examples of path dependency in communication history is one of the very oldest. It turns out that the spoken language of ancient Egypt was naturally amendable to a phonetic alphabet. Each of the twenty-two consonant sounds in use was represented by a unique hieroglyphic. The scribal hierarchy realized this and successfully resisted the spread of literacy in the general population by insisting on a much more complex all-hieroglyphic system for each word (akin to modern Mandarin, Japanese, and Korean). The professional scribes retained their power and unique position in Egyptian society for another millennium, until the Phoenicians and Greeks developed more accessible alphabetic writing systems (Saggs 1989, 74). Notably, what benefited the scribal status did not necessarily benefit progress in Egyptian culture and economics.

Michels's (1962) *iron law of oligarchy* adds a special sociopolitical dimension to the analysis of path-dependent media evolution. Michels's own work focused on political parties and labor unions, but the dynamic applies more broadly. He notes that in the historical evolution of complex organizations (in our case necessary to support complex network technologies) the bureaucracy increasingly restructures decision processes to serve bureaucratic ends, rather than the goals for which the organization was originally put in place, in effect hijacking control of the institutional structure. One example in modern media debates is intellectual property law: lawyers and industry lobbyists find it in their interest to continue litigation rather than develop new processes for technically sophisticated intellectual property remuneration that may benefit cultural creators and audiences, rather than litigators (Litman 2000).

Another conceptual instrument to add to our toolkit is *constitutive choice*, developed by sociologist Paul Starr. It bridges the notions of historical and technical constraint and of mindful deviation and in many ways, I will argue, characterizes the current historical threshold. His history of American media institutions centers on critical constitutive moments, historical windows of opportunity when

ideas and culture come into play, as do constellations of power, preexisting institutional legacies and models from other countries. Although the people directly involved in the decisions may not be aware of their long-term implications, institutions and systems once

established often either resist change or invite it in a particular direction. . . . Early choices bias later ones and may lead institutions along a distinctive path of development. (2004, 1–2)

Starr narrates the evolution of American media institutions through the nineteenth and twentieth centuries with a careful eye for the conditions that promoted or resisted change. He notes, for example, that one might attribute the American decision to leave telegraphy and telephony to private industry—rather than government ownership and management, as in Europe and much of the rest of the world—to the characteristic American predilection toward free enterprise. Not so fast, he warns, explaining that the dramatic success of public section investment in canals and direct and indirect investment in railroad infrastructure had generated a very strong wave of support for a federally managed electronic communication system. Indeed the first telegraphic link between Washington and Baltimore was indeed a federally sponsored prototype system, and Samuel Morse himself favored federal ownership. It could easily have been otherwise, but the political winds blowing north and south in the decades prior to the Civil War, and particularly the election of 1844 and the ascendancy of President Polk, tipped the balance toward private ownership (Starr 2004, 163).

### Systemic Theories

Several of our authors are less interested in various models of heroic and suppressive initiatives and focus on what might be labeled systemic factors. The historical actors, of course, are no less important, but the analyst's attention focuses on a particular progression of technical developments, especially uneven technical development. This is a central notion in the SCOT tradition organized around the notion of a *reverse salient*, that is, an element or problem in a complex system that appears to be holding progress back. Hughes's (1987) classic example of a reverse salient was Edison's concern that the price of copper would hold back the development of electric lighting. The ultimate solution was high-resistance lightbulb filaments that reduced power demands and accordingly the amount of copper required for the electrical grid to function. This is distinctly not an exemplar of technical determinism, far from it. The model requires a socially defined perception that an element within the system is a problem and a socially defined notion of the functionality of the system itself that is being held back. Beniger's (1986) "crisis

of control” in nineteenth-century industrialization was another example of a reverse salient, as railroad and manufacturing systems outstripped the capacity of human control with their growing speed and complexity and required the innovation of electronic communication and control systems.

A related notion that will be put to work in the pages ahead is *excess capacity*—a salient rather than a reverse salient, a system element that is ahead of others in technical development and accordingly is underutilized (Johanson 1968). When a particular capacity is socially defined as “underutilized,” that too becomes a problem that draws institutional attention and innovation.

Perhaps the most prominent systemic model of the history of technical succession is simply the notion of improved *technical and industrial efficiency*. Variations on a mechanical apparatus replace human labor. The steam-driven roll press replaces the hand-operated screw press. Radio replaces the town crier, and incidentally the newspaper extra edition. Brian Winston’s fulsome turn of phrase for this phenomenon is *supervening social necessity*; he describes how some prototypes but not others are implemented as industrial standards, but core explanations usually boil down to simple physical and economic efficiency.

## Media Evolution

So far we have reviewed a variety of conceptual lenses for understanding the dynamics of innovation and structural change broadly used in the fields of science and technology history. They represent relatively well-developed models that are applicable over a wide range of historical circumstance. Of special interest here are institutions of mass communication, which draw our attention to several communication-specific theoretical traditions.

The *principle of relative constancy* is drawn from the observation that American consumers appeared to have kept their spending on communication media as a relatively constant percentage of total income in the latter half of the twentieth century (McCombs 1972; McCombs and Eyal 1980; McCombs and Nolan 1992). As the theory was refined in the literature, analysts drew attention to the notion of *functional equivalence*, the mechanism predicting that as new media come along that better serve a particular function, the use of the previously dominant medium that served that function declines. Thus television replaced radio as a primary home family entertainment medium in the evening and radio

moved to the bedroom, kitchen, and car. And the cellular phone displaces the wireline phone, especially among the young (Dupagne 1997; Dupagne and Green 1996).

Following the expansion of communication flows through increasingly broadband digital networks, we confront the *communication flow paradox*, observed by Ithiel de Sola Pool and associates in the 1980s: although the flow of information may continue apace with Moore's law of computer computational capacity, the twenty-four-hour day and physiological limits of multitasking must put a practical limit on media consumption (Pool 1983; Neuman and Pool 1986). The flow paradox may be seen as a distant theoretical cousin of the relative constancy finding, because both draw attention to gating functions and fundamental limits to media use—a temporal constraint in flow and a financial one in relative constancy.

If the quantity of information flow increases as a function of the efficiencies and increasing bandwidth of digital media, an intriguing question arises—will the diversity of available information and entertainment increase as well? The notion of commercial mass communication has long been associated with highly formulaic, mass-produced, common denominator fare. The cluster of theories here focus on the economic sustainability of targeted special-interest content and narrowcasting. The most widely cited model is that of the *long tail* developed by Christopher Anderson (2006). The thesis posits that companies like Amazon and Netflix with their national markets and computerized inventory not only have a greater capacity to service backlist books and videos outside the best-sellers and box office hits, they have strong economic incentives to promote the sales of a more diverse “product mix.” Anderson focuses primarily on the diversity of content sustainably offered by an individual firm. Previous to this work, the emphasis was less on diverse offerings than on the diversity of competing firms and of ownership under the theoretical banner of *media diversity* (Bagdikian 2004; Schiller 1989). Media diversity is a key analytic concept of media economics and media regulation and is based on the notion that a diverse marketplace of ideas is best served by a structurally diverse pattern of media ownership, including nonchain local ownership, and ownership by individuals of diverse backgrounds, particularly gender and ethnicity. Although the evidence that diverse or local ownership leads to diverse programming is mixed (given the profit-maximizing constraints of the commercial media environment), the concept remains at the forefront of policy and economic analysis (Einstein 2004; Napoli 2006; Noam 2009).

## The Structure of This Volume

Our contributors are diverse. They draw on backgrounds in law, economics, history, communication, sociology, journalism, and political science. Although conference organizers managed to get them into the same room several years ago, they are far from being on the same page, philosophically, politically, and historically. They share an aversion to reductive technological determinism and a strong inclination to take technology seriously as they study evolving cultural norms, economic institutions, and public opinion. None would claim to have a complete picture of how the digital revolution will resolve, or whether resolution is even an appropriate descriptor for the near future. But all of these authors have much to contribute to a better understanding of where we stand and where we are headed because they have been at pains to examine carefully where we have been.

As an editor introducing a volume of studies diverse in analytic focus, disciplinary roots, and style of exposition, I have resisted an attempt at discipline and enforced orthodoxy not just because it would have little chance of success (one is drawn to the metaphor of the herding of cats) but because it would diminish what I believe is a real strength of the enterprise—the prospect of intellectual convergence from diverse starting points. Given that we stand at the beginning of the process, true theoretical convergence is in the hands of the active readers who are challenged to compare and contrast narratives and analyses collected here.

To assist in that process, let me briefly review the chapters in this volume to assess which elements of the theoretical toolkit previously outlined the authors put to use. Table 1 highlights some of the key references. All of the contributors draw informally or explicitly on the social construction tradition pioneered by Bijker and colleagues (1987) in studying the coevolution of communication technologies and social-cultural definitions of their appropriate use. Following the usage in this introduction, when theoretical traditions are introduced for the first time in each chapter, they are italicized.

Pablo J. Boczkowski's essay on the culture of the newspaper industry contrasts the *visionary rhetoric* of senior newspaper executives as they confront the challenge of the Internet with the *resilient interpretive schemes* and newsroom norms evolved from journalism's storied history in the nineteenth century. As a result the *championship of innovation* is haltingly reactive, defensive, and pragmatic, permitting new competitors to gain an upper hand. Surprisingly, by experimenting with electronic news-

TABLE 1. THEORIES, THEORISTS, AND MEDIA: A PARTIAL LIST

Thematic	Theories	Authors	Media
Heroic	Visionary rhetoric	Boczkowski	Newspapers
Heroic	Visionary rhetoric	Ling	Telephony, radio
Heroic	Innovation champion	Carey	Radio
Heroic	Innovation champion	Schwartz	Television
Heroic	Innovation champion	Sawhney	Cable television
Heroic	Path dependency	Edwards	Internet
Heroic	Founding myth	Edwards	Internet
Counterpoint	Resilience of interpretive schemes	Boczkowski	Newspapers
Counterpoint	Law of suppression	Schwartz	Television
Counterpoint	Constitutive choice	Etzioni	Internet, telephony
Counterpoint	Law of suppression	Sohn/Schneider	Internet
Counterpoint	Resilience of interpretive schemes	Sohn/Schneider	Internet
Systemic	Reverse salient	Sawhney	Cable television
Systemic	Excess capacity	Sawhney	Cable television
Systemic	Efficiency	Noam	Motion pictures, Internet
Media Evolution	Relative constancy	Carey	Radio
Media Evolution	Functional equivalence	Carey	Radio
Media Evolution	Media diversity	Carey	Radio

paper delivery via videotex and teletext in the 1980s, newspapers were technically ahead of the still evolving Internet. But a defensive posture based on a closed and proprietary system turned out to be an inadequate model for technical leadership and “moving with their readers” to the digital age.

In the next chapter Rich Ling tracks the use of *visionary rhetoric* from the early days of the commercialization of electricity and telegraphy to the widely cited “Negroponte switch” as the wireless broadcast media (television) move to wireline delivery (cable TV and Internet) and the previously wired medium of the telephone is increasingly wireless as the cell phone moves to dominate personal voice and text messaging.

The next chapter, “Hollywood 2.0,” turns our attention to the evolving economics of the motion picture industry as Eli Noam ponders whether Hollywood will wither away in a struggle with low-cost global competition. The fundamental technology of the 35mm motion picture camera and projector has been stable and unchallenged for eighty years. Digital video, computer-based editing, and Internet distribution, however, present new challenges to the traditional business model of celluloid celebrity. Noam’s surprising conclusion is that Hollywood will

not only survive but probably thrive in the new environment, primarily because of its capacity for *industrial efficiency*. It seems counterintuitive—big studios, high overhead, old ways of doing business. Noam explains that the iconic cigar-chomping Hollywood mogul leading an inefficient studio system unchanging since the 1930s is an image perhaps frequently found on the screen but it is not an accurate representation of the modern industry behind the screen.

Radio has survived television; will it survive the Internet? John Carey begins by looking forward but quickly concludes that the future of radio is rooted in its past. He traces the role of innovation champions from the earliest days of crystal radio sets to the rebirth of innovation in satellite and Internet radio eighty years later. He introduces the Steiner Paradox, which posits that true content diversity may be served best by monopolists rather than competitive ownership in the traditional media diversity model.

Evan I. Schwartz narrates the epic battle between independent inventor and *innovation champion* Philo Farnsworth and RCA founder and CEO David Sarnoff. It resonates with many of the counterpoint theories including *the Suppression of radical potential*, *closure*, and *the iron law of oligarchy*. It is a story so compelling it found its way to Broadway in 2007–8 as *The Farnsworth Invention*. In this case it was less a battle to suppress an invention than a battle to control it commercially. Unlike the early days of radio recounted by John Carey, when few had a sense of what radio could do, by the 1930s and 1940s people had come to expect some form of television and had a rough idea of its character and function—a commercial entertainment medium, basically radio with pictures.

Cable television started as minor footnote in the early days of television, primarily a shared cable connected to large television antenna for remote suburban and rural communities. These smaller markets were largely ignored by the television industry and constituted what systems analysts call a *reverse salient*, an unappreciated component of system development, a systemic blind spot. In time cable would come to be the primary medium for accessing television, leaving only 14 percent of television viewers still viewing a broadcast signal through rabbit ears (SNL Kagan 2008). What explains its growth and dominance? The answer is a systemic dynamic, Harmeet Sawhney argues, based on the commercial instinct to exploit *excess capacity*. Cable system operators realized they had the capacity to carry more than just local channels, and a truly diverse multichannel video medium was born in 1975 as satellite dishes made multichannel signal transmission possible to evolving and increas-

ingly popular cable television systems. Sawhney concludes in drawing on Agre's amplification concept, a variant of SCOT and coevolutionary theory.

Paul N. Edwards's chapter turns to the most recent development in media technology—the Internet. The particularly curious characteristic of this new digital network is that its evolution was fundamentally a series of fortuitous accidents. The early developers of what was then known as the ARPANET (for the U.S. Department of Defense's Advanced Research Projects Agency) were experimenting with highly specialized military communication that would not be subject to disruption by opposing military forces. A public global digital network may have been the farthest thing from their minds. They designed a digital network that would get the message through despite military challenge and basically ignored developing any scheme for charging users and controlling the use of the network. The task was to design a network that could not be easily controlled (by the enemy), and as a curious and unintended result, commercial vendors and authoritarian governments find it frustratingly difficult to manage and manipulate the modern Internet. Thus from the perspective of commercial or governmental control, as Edwards suggests, the Internet should never have happened. Its developers, of course, are now heroic celebrities and genius inventors of the first rank, and Edwards pauses to examine these *founding myths* and the remarkable robustness of the technology, a notable exemplar of *path dependency*.

In the final two chapters of this volume we turn to overarching questions of policy that span the historical trajectories of individual technologies. Amitai Etzioni has developed an enviable reputation as a thoughtful student of public policy and has in recent years turned to the parallel issues of security and privacy in the digital age. His conclusion is both counterintuitive and provocative. He argues that the digital revolution provides the concerned individual a greater capacity for privacy, rather than less. Etzioni is far from a *technological determinist*, but his analysis points to a clear case of the capacity of technological affordances, the interaction of cultural and technical change. Indeed, he traces a particularly troubling cycle of imbalance and overcorrection in American political history between security and privacy in which technology plays an important but hardly a leading role. The security-privacy dynamic is often seen as a straightforward trade-off. Not necessarily so, Etzioni argues—consider it a *constitutive choice*.

Our final chapter, by legal scholars and activists Gigi Sohn and Timothy Schneider, draws us into the thorny legal realm of copyright and

digital rights management. Sohn and Schneider make a powerful case that the historical trajectory of the one-way media of publishing and broadcasting we have been reviewing has collided awkwardly with a digital revolution that makes copying, sharing, and collaboratively producing culture as easy as consuming it. It is a classic case of youthful and perhaps heroic rebellion against established interests and traditional business models. From the innovators' point of view it is a classic case of the *suppression of radical potential* and (among established interests) the *resilience of interpretive schemes*.

### An Eye to the Future

Historians take great pride in getting it right. They spend long hours with original sources, poring over dusty files to set the factual record straight in the disciplined Teutonic spirit of nineteenth-century German historian Leopold von Ranke (the very first honorary member of the American Historical Society). Speculating about what the past augurs for the future, according to this school of thought, should be eschewed. Such speculation would seem to threaten the sanctity of historiography, distract historians from their important work, and perhaps taint them with current disputes about the nature of politics and power.

Alas, our authors are tainted, one and all. They are not, strictly speaking, historians. They are communication scholars, sociologists, lawyers, and technologists. For this community, drawing lessons for the future is the very much the point of poring over the past. Our contributors' chapters are historically incomplete and selective in emphasis. These authors have a point of view as they write and usually a theory or two in hand. This is thick historical description in the spirit of anthropologist Clifford Geertz (1973). Thus in this introductory chapter we have reviewed theories and mechanisms and generalizations about how technical and social change interact—how we can draw lessons from the past to better understand the future—our patron Janus again.

It is widely noted that predictions about the digital future tend toward either utopian (e.g., Negroponte 1995) or dystopian visions (e.g., Zittrain 2008). For the most part, our authors steer away from both hang-wringing and arm-waving. The picture is mixed.

Proceed, esteemed reader. The stories are engaging and the issues they raise about innovation and political control are important. Our authors will not claim that history is doomed to repeat itself; that would be folly. But the historical patterns unfolding have a curious familiar-

ity—as Twain would have it: If history doesn't repeat itself, it does seem to rhyme.

#### REFERENCES

- Anderson, Chris. 2006. *The Long Tail: Why the Future of Business Is Selling Less of More*. New York: Hyperion.
- Bagdikian, Ben H. 2004. *The New Media Monopoly*. Boston: Beacon Press.
- Beniger, James R. 1986. *The Control Revolution: Technological and Economic Origins of the Information Society*. Cambridge: Harvard University Press.
- Bijker, Wiebe E., Thomas P. Hughes, and Trevor Pinch, eds. 1987. *The Social Construction of Technological Systems*. Cambridge: MIT Press.
- Bourdieu, Pierre. 1991. *Language and Symbolic Power*. Ed. John B. Thompson. Trans. Gino Raymond and Matthew Adamson. Cambridge: Harvard University Press.
- Bourdieu, Pierre. 1993. *The Field of Cultural Production: Essays on Art and Literature*. Ed. Randal Johnson. New York: Columbia University Press.
- Carlyle, Thomas. 2008. *On Heroes and Hero Worship and the Heroic in History*. Charleston, SC: Bibliobazaar.
- Castells, Manuel. 1996. *The Rise of the Network Society*. Malden, MA: Blackwell.
- Christensen, Clayton M. 1997. *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*. Boston: Harvard Business School Press.
- Comstock, George, Steven Chaffee, Natan Katzman, Maxwell E. McCombs, and Donald Roberts. 1978. *Television and Human Behavior*. New York: Columbia University Press.
- David, Paul A. 1985. "Clio and the Economics of Qwerty." *American Economic Review* 75:332–37.
- Dupagne, Michel. 1997. "A Theoretical and Methodological Critique of the Principle of Relative Constancy." *Communication Theory* 7 (1): 53–76.
- Dupagne, Michel, and R. Jeffery Green. 1996. "Revisiting the Principle of Relative Constancy: Consumer Mass Media Expenditures in Belgium." *Communication Research* 23:612–35.
- Durham, William H. 1991. *Coevolution: Genes, Culture, and Human Destiny*. Stanford: Stanford University Press.
- Einstein, Mara. 2004. *Media Diversity: Economics, Ownership, and the FCC*. Mahwah, NJ: Erlbaum.
- Garud, Raghu, and Peter Karnøe, eds. 2001. *Path Dependence and Creation*. Mahwah, NJ: Erlbaum.
- Geertz, Clifford. 1973. *The Interpretation of Cultures*. New York: Basic Books.
- Gersick, Connie J. G. 1991. "Revolutionary Change Theories: A Multilevel Exploration of the Punctuated Equilibrium Paradigm." *Academy of Management Review* 16 (1): 10–36.
- Giddens, Anthony, ed. 1984. *The Constitution of Society*. Berkeley and Los Angeles: University of California Press.
- Habermas, Jürgen. 1989. *The Structural Transformation of the Public Sphere: An Inquiry into a Category of Bourgeois Society*. Trans. Thomas Burger with Frederick Lawrence. Cambridge: MIT Press.

- Hallin, Daniel C., and Paolo Mancini. 2004. *Comparing Media Systems: Three Models of Media and Politics*. New York: Cambridge University Press.
- Hellman, Hal. 2004. *Great Feuds in Technology*. Cambridge: MIT Press.
- Hughes, Thomas. 1987. "The Evolution of Large Technological Systems." In *The Social Construction of Technological Systems*, ed. Wiebe E. Bijker, Thomas P. Hughes, and Trevor Pinch, 51–82. Cambridge: MIT Press.
- Hutchby, Ian. 2001. "Technologies, Texts and Affordances." *Sociology* 35:441–56.
- Johanson, Leif. 1968. "Production Functions and the Concept of Capacity." *Collection Economie et Mathematique et Econometrie* 2:46–72.
- Latour, Bruno. 1987. *Science in Action: How to Follow Scientists and Engineers through Society*. Milton Keynes: Open University Press.
- Litman, Jessica. 2000. *Digital Copyright: Protecting Intellectual Property on the Internet*. Amherst NY: Prometheus Books.
- McCombs, Maxwell E. 1972. "Mass Media in the Marketplace." *Journalism Monographs* 24 (August).
- McCombs, Maxwell E., and Chaim H. Eyal. 1980. "Spending on Mass Media." *Journal of Communication* 30 (1): 153–58.
- McCombs, Maxwell E., and Jack Nolan. 1992. "The Relative Constancy Approach to Consumer Spending for Media." *Journal of Media Economics* 5 (2): 43–52.
- Michels, Robert. 1962. *Political Parties: A Sociological Study of Oligarchical Tendencies of Modern Democracy*. New York: Collier Books.
- Napoli, Philip M., ed. 2006. *Media Diversity and Localism: Meaning and Metrics*. Mahwah, NJ: Erlbaum.
- Negroponte, Nicholas. 1995. *Being Digital*. New York: Knopf.
- Neuman, W. Russell, and Ithiel de Sola Pool. 1986. "The Flow of Communications into the Home." In *Media, Audience, and Social Structure*, ed. Sandra J. Ball-Rokeach and Muriel G. Cantor, 71–86. Beverly Hills: Sage.
- Noam, Eli. 2009. *Media Ownership and Concentration in America*. New York: Oxford University Press.
- Orlikowski, Wanda. 1992. "The Duality of Technology: Rethinking the Concept of Technology in Organizations." *Organisation Science* 3 (3): 398–427.
- Pool, Ithiel de Sola. 1973. "Communication in Totalitarian Societies." In *Handbook of Communication*, ed. Ithiel de Sola Pool and Wilbur Schramm, 462–511. Chicago: Rand McNally.
- Pool, Ithiel de Sola. 1983. "Tracking the Flow of Information." *Science* 211:609–13.
- Saggs, H. W. F. 1989. *Civilization before Greece and Rome*. New Haven: Yale University Press.
- Schiller, Herbert I. 1989. *Culture, Inc.: The Corporate Takeover of Public Expression*. New York: Oxford University Press.
- Schmidt, Susanne K., and Raymund Werle. 1998. *Coordinating Technology: Studies in the International Standardization of Telecommunications*. Cambridge: MIT Press.
- Schudson, Michael. 1978. *Discovering the News: A Social History of American Newspapers*. New York: Basic Books.
- Shapiro, Carl, and Hal R. Varian. 1998. *Information Rules: A Strategic Guide to the Network Economy*. Boston: Harvard Business School Press.
- SNL Kagan. 2008. *Media Trends*.
- Starr, Paul. 2004. *The Creation of the Media: Political Origins of Modern Communications*. New York: Basic.

- Stukeley, William, ed. 1936. *Memoirs of Sir Isaac Newton's Life*. London: Taylor and Francis.
- Winston, Brian. 1986. *Misunderstanding Media*. Cambridge: Harvard University Press.
- Winston, Brian. 1998. *Media Technology and Society: A History*. New York: Routledge.
- Wirth, Michael O. 2006. "Issues in Media Convergence." In *Handbook of Media Management and Economics*, ed. Alan B. Albarran, Sylvia M. Chan-Olmsted, and Michael O. Wirth, 445–62. New York: Routledge.
- Zittrain, Jonathan. 2008. *The Future of the Internet and How to Stop It*. New Haven: Yale University Press.