International Journal of Communication 6 (2012), 1022–1041 1932–8036/20121022

Information Capacity
IJoC

Tracking the Flow of Information into the Home: An Empirical Assessment of the Digital Revolution in the United States, 1960–2005

W. RUSSELL NEUMAN
University of Michigan

YONG JIN PARK
Howard University

ELLIOT PANEK
University of Michigan

This study analyzes the increasing dominance of electronic media in the American media diet and a growing discrepancy between supply and demand in the digital cornucopia. Drawing on the communication flow methodology pioneered by Ithiel Pool in the 1980s, the study tracks U.S. industry data on technology penetration and household behavior from 1960 to 2005 to reveal a transition from "push" to "pull" media dynamics.

At the dawn of the digital age in the early 1980s, pioneering student of media technology Ithiel de Sola Pool published a series of studies on the growing flow of information in the American and Japanese mass media (Neuman & Pool, 1986; Pool, 1983; Pool, Inose, Takasaki, & Hurwitz, 1984). Pool had worked with Japanese and American colleagues over the previous decade, trying to quantify the increasingly electronic media supply in meaningful terms and subject the analysis to further theoretical study of how these trends might affect levels of information, diversity of information, and possible polarization within the mass population consuming these media. Pool saw himself as expanding the research agenda and the key methodologies for better understanding the dynamics of the information age. Until the publication of Pool's work, scholars had relied primarily on aggregate economic data focusing on employment patterns to track the transitions from the agricultural to the industrial and in turn to the information age (Bell, 1979; Machlup, 1962; Porat, 1977).

W. Russell Neuman: rneuman@umich.edu
Yong Jin Park: yongjin.park@howard.edu
Elliot Panek: elpanek@umich.edu
Date submitted: 2011–08–04

Pool recognized the equal importance of understanding how much information was "out there" and how much was actually being consumed by the population at large. The key variables of analysis were the number of words supplied and consumed yearly at a national level and the average price per word in various common media. His dramatic findings led to an obvious conundrum. First he noted, the flow was increasingly electronic. Second, the price per word was falling radically. Third, the supply was growing at an impressive compounded rate of 8.8% per annum. Fourth, the growth rate of consumption—though also impressive at 3.3% per annum, compounded—was considerably slower, thus generating a growing disparity between information supplied and information consumed (see Figures 1 and 2).

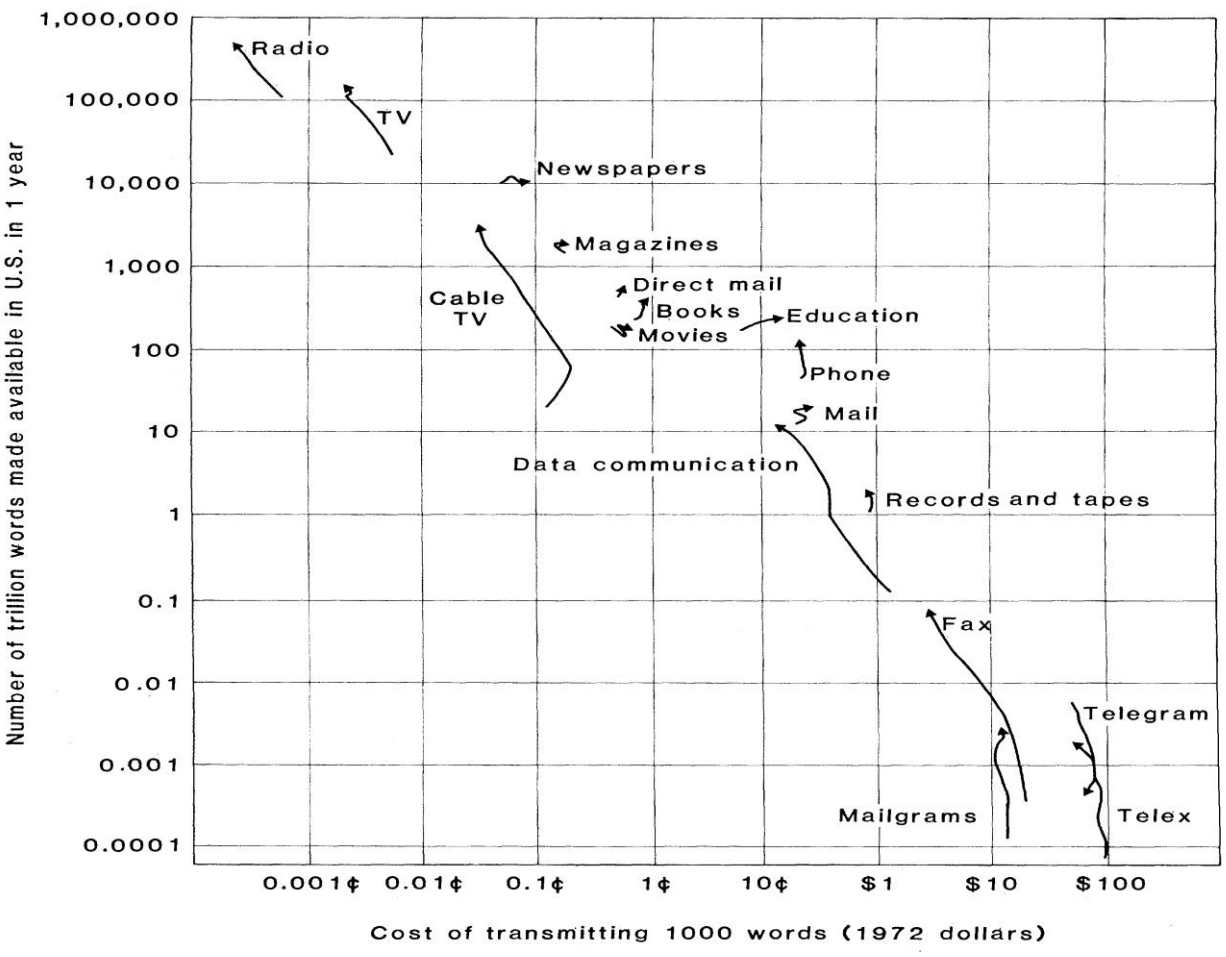

Figure 1. Declining Costs and Increasing Volumes of Communication in the United States, 1960–1977. Source: Pool, 1983.

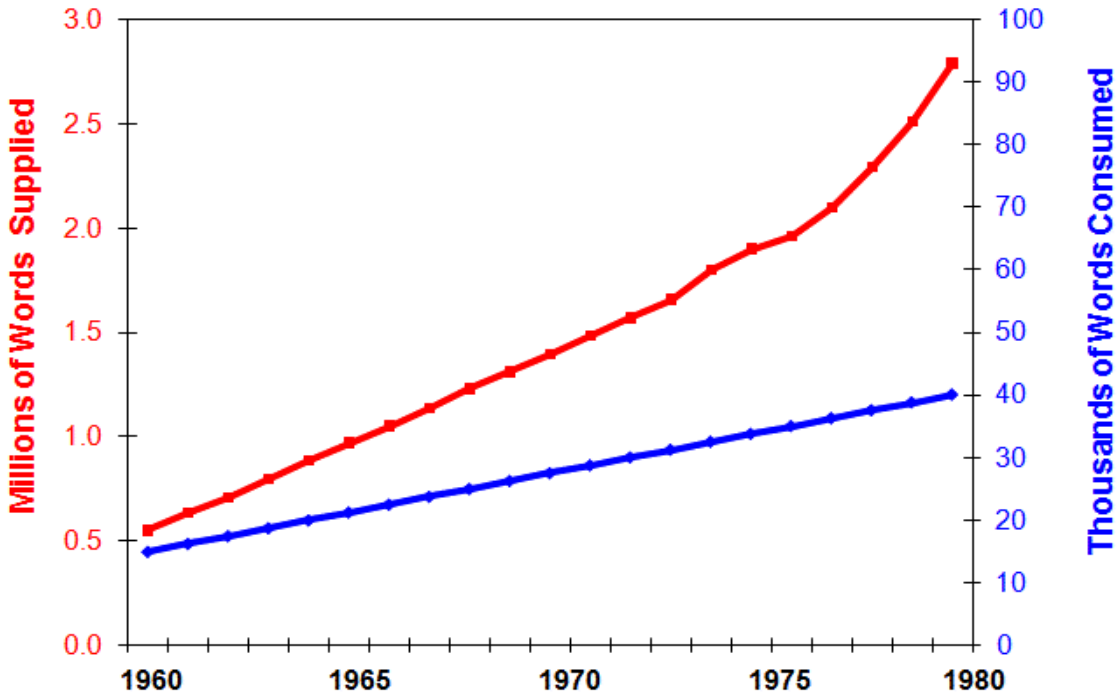

Figure 2. Increasing Supply Outpacing Consumption of Communication in the United States, 1960–1980. Source. Neuman & Pool, 1986.

A conundrum? Well, there might not be a technical limit on supply, but there are only 24 hours in the day—a clear-cut limit on individual consumption of mass media. Pool and colleagues speculated about information overload, information diversity, and the economics necessary to sustain vibrant creative industries in journalism and popular and high culture. The basic theoretical proposition of this research tradition was to challenge a generally unquestioned tenet in the historical analysis of media trends—namely, that more is necessarily better—by suggesting that some levels of media quantity can make informed choice impractical and perhaps even frustrating (Bell, 1979; Blumler, 1980; Eppler & Mengis, 2004; Miller, 1960). Further, this research challenged the notion that new media replace or partially replace older media, a notion generally referred to as relative constancy theory (Dupagne & Green, 1996; McCombs, 1972). Relative constancy theory relies primarily on expenditure data rather than words or minutes of usage, but the underlying argument is the same: time budgets and financial budgets constrain

growth of media supply and media use. Much of this work took place a decade before the introduction of the Internet-linked PC that has dramatically reinforced these trends of expanding media supply and raised new questions about supply, demand, overload, attentional dynamics, and economic viability (Gitlin, 2002; Hindman, 2009).

We felt the methodological promise and theoretical provocation of this work merited further attention, so we picked up where Pool left off in 1980. With a few adjustments and minor corrections, and focusing on the U.S. case, we carried the data collection forward to 2005. In this report, we present supply and consumption vectors for 12 traditional mass and interpersonal media and the evolving Internet for the period from 1960 to 2005.

In the years since 2005, we have witnessed an even more dramatic digital convergence as traditional media flows from recordings, newspapers, books, television and movies are increasingly delivered via the Web itself, making the distinction between, say, broadcast TV and a digitally delivered video program an increasingly subtle one. These trends, which have important ramifications for economic viability, audience choice, and content diversity, are the subject of our ongoing research. Because digital video was still at an early stage in 2005 (the iTunes store, e.g., was not introduced until mid-2003), we have set aside the convergence/transition issue for a later analysis. The Internet, by contrast, occupied users' active attention for about 1.5 hours per day in the average American household by 2005 (U.S. Census Bureau. Statistical Abstract of the United States, 2005). Thus we will treat it as "competing" with traditional media for users' attention, in time budget terms, with a mix of independent and overlapping content.

Methods

Pool's original Japanese and American work focused on assessing media volume measured in quadrillions of words per medium per annum at a national level. This metric was useful for international comparison of trends and infrastructure, but because quadrillions of anything challenge conceptualization, our focus in this analysis is a more human-level metric addressing the dynamics of choice and attention. To that end we present all annual data, divided by 365 days and the total number of households in the nation, to assess the flow of information into the typical home on a 24-hour day, largely measured in the thousands, a more interpretable and accessible metric. We also switched from words to minutes as the principal measure. A common metric is required to analyze both print media that are measured in spatial terms—column inches, thousands of words—and broadcast media that are measured in temporal metrics of minutes and hours. Following Pool, we take the average adult American reading speed of 240 words a minute to approximately equate space and time.

The original analyses of Pool and associates made a practical strategic choice to focus on just the flow of words, ignoring proverbial "elephants in the room" represented by still and motion imagery and graphic representations. Today's world is replete with increasingly high-resolution graphics and expanded video displays that warrant close attention and analysis. As a starting point for the present analysis, however, we pick up where Pool left off, setting aside the graphic component. (It will, however, be a very important analytic and methodological question in the future, as high-definition video and 3-D imagery increasingly dominate the digital flow.) Adding to the ongoing work on the years since 2005, we are

expanding our analysis of trends in the consumer price associated with each medium per minute and developing an assessment tool for measuring diversity of content sources.

Taking Pool's original data and measurement definitions as our starting point, we turned to new data sources as necessary and dropped a few media, such as telex and telegrams, to focus on the historical continuity of the primary mass and interpersonal media. The measurement of supply pivots on what is available to a typical household at a particular historical interval, so we used the pooled average of selected median-sized cities in the United States (Charlotte, NC; Indianapolis, IN; San Diego, CA; Raleigh-Durham, NC) to estimate the typical number of available over-the-air broadcast television stations, which calculate out to four stations in 1960, growing to nine stations by 2005. We did similar calculations for radio, newspapers, and other media. This averaging obscures the fact that the typical urban household often enjoys the availability of many more channels than the typical rural household does. However, these differences become less distinct with the increasing reliance on cable, satellite, and the Internet rather than traditional over-the-air transmission and local printing as the primary media of content transmission.

The period under study is one of significant growth for the United States. The U.S. population grew from 181 million to 296 million individuals, or from 52 million to 113 million households; meanwhile, the average number of persons per household dropped from 3.29 to 2.63 during these 46 years. If the number of movie screens in existence had stayed constant, the number of screens available per capita (or in our case per household) would have declined, reflecting a relative decline in supply. That did not happen, however. Instead the growth in the number of movie screens outpaced population growth, rising significantly from 12,291 to 38,852 screens (more theaters and more screens per theater), typifying the growth in supply characteristic of almost all media for this period. Other patterns of increasing supply included increased per-household availability of television (the average number of working TVs nearly tripling from 1 to 2.7) and radio (the average number of receivers, including portable and automotive radios, jumping from 5 to 8). Perhaps as a function of affluence, or at least the perception thereof, people also bought ever more magazines and books, although, importantly, they bought fewer newspapers. Our primary sources of data include industrial trade associations, audience measurement firms, academic studies, and government analyses. Lists detailing the sources and formulas for calculating supply and consumption for each medium are presented in Appendices 1, 2, and 3.

Given the involvement of significant sums of money, assessment of media supply is carefully monitored and vetted as various commercial media outlets keep an eye on the competition. The matter of consumption is somewhat more difficult, as individuals rely on memory to fill out viewer diaries or recall how many minutes they spent "reading a newspaper yesterday." Our strategy was to record all available measures, assess measurement biases associated with each, and, as appropriate, compute a weighted average. Take, for example, the difficult assessment of number of minutes per day of radio listening. John Robinson's well-known 24-hour recall time budget survey reveals an average total of four minutes a day per individual (Robinson & Godbey, 1997). The official Arbitron commercial radio ratings, however, estimate an hour and 20 minutes per day per individual. The difference is significant but easily understood. In his survey, Robinson asked people to recall what they were doing as they proceeded through the day, hour by hour. Most radio listening from bedside, bathroom, kitchen, and car radios is, in fact, a secondary or tertiary activity that is unlikely to be mentioned as the primary recalled activity of the hour according to Robinson's methodology. The mechanical devices and diaries listing favorite radio stations that Arbitron uses to assess radio listening establish very different grounds for recall. Ball State's

recent extensive field/ethnographic study following typical media users from morning to night concludes that the Arbitron measures are more accurate (Papper, Holmes, Popovich, & Bloxham, 2005). But since we are focusing on trends rather than static metrics, the parameter calculation is less important. Notably, both Arbitron and Robinson report equivalent and steep declines in radio listening over this period.

Findings

The patterns Pool uncovered continue, and in many cases accelerate, in recent years. The broadcast media of radio and television continue to be the American public's primary sources of information and entertainment (see Figure 3). Although radio listening has decreased somewhat in the face of competition from other audio media such as the Walkman and iPod, the supply has increased as a result of more radio stations, more hours broadcast per day, and more radios in the home and car. The larger number of broadcast stations accounts for only a small degree of the expansion of television supply, which is primarily an outcome of the proliferation of cable and satellite TV. In 2005, cable or satellite delivery was the primary source of television for 84% of American television viewers. In 1960, the share of cable subscribers was only 1%, and commercial satellite TV was not yet available. In 1960, the typical number of cable channels available on most systems was 8, but by 2005, it had grown to 110. Figure 4 reports the growth of radio and television with separate and finer-grained metrics: radio in blue, with the minutes per day axis on the right of the figure, and television in red, measured at the left-hand axis. This reveals a pattern hidden in the combined graphic of Figure 3: The growth of radio supply was steep and relatively constant, whereas the growth of television supply took off in the late 1970s (just as Pool's data collection was concluding), fueled, as we have observed, primarily by the growth of multichannel cable and, later, satellite television.

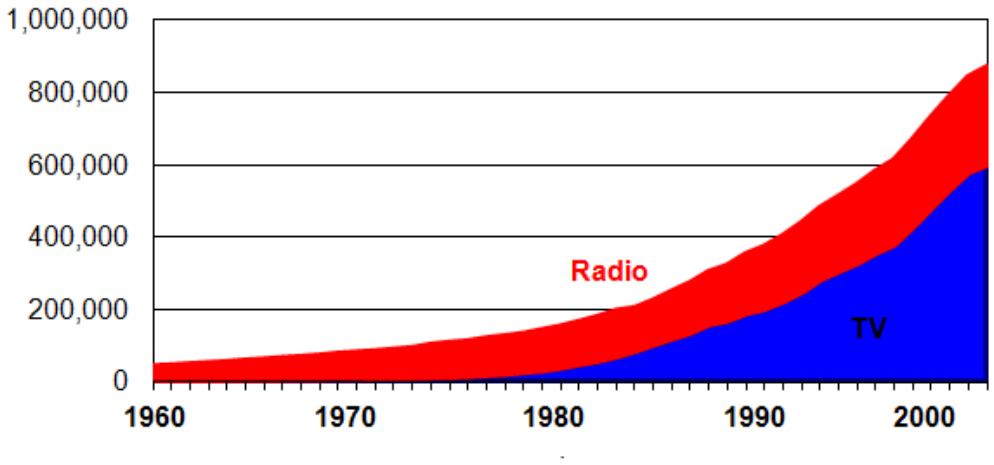

Figure 3. Media Supply to Homes in Minutes Per Day: Radio and TV, 1960–2005.

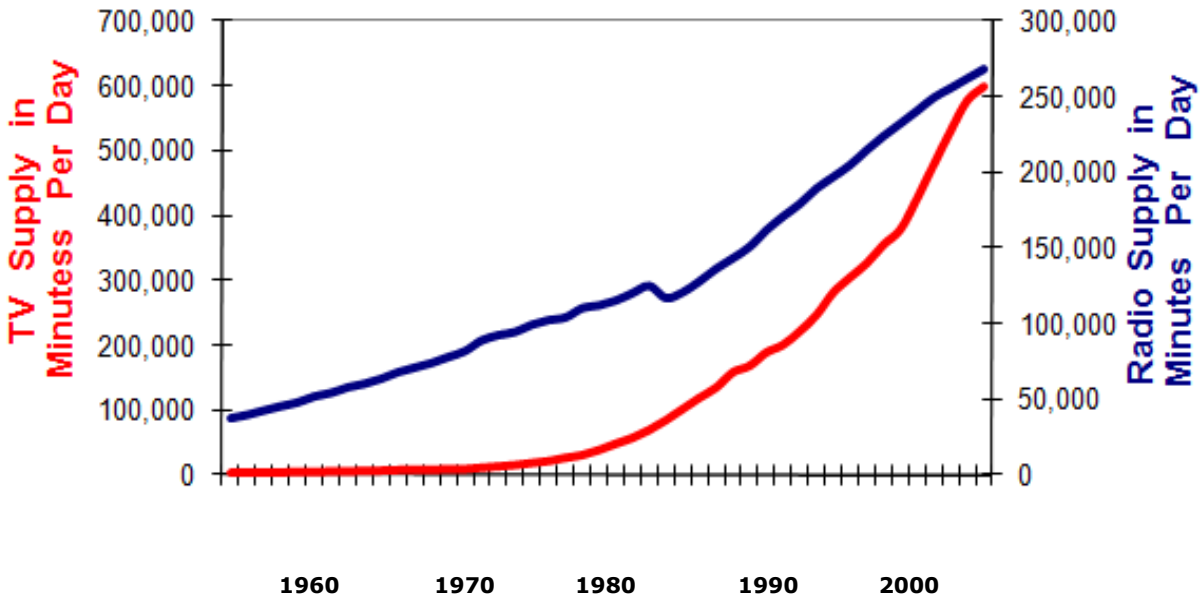

Figure 4. Media Supply to Homes in Minutes Per Radio and TV, 1960–2005. Separate Axes of Measurement

Figure 5 tracks a recently exacerbated pattern that is a matter of some concern in journalism—the steady decline of the daily newspaper (Meyer, 2004). Here, we report on the parallel slopes of declining demand and declining supply. Fewer households subscribe to newspapers or buy them from newsstands. In 1960 there were, on average, 1.1 newspapers per household. In 2005, the number was 0.5 per household. And the number of minutes of newspaper reading per day also declined, from 18 minutes to 7. The newspaper-reading habit is largely restricted to older Americans. Relatively few younger citizens read newspapers at all, so this decline primarily affects cohort demographics, fueling an exodus of youth-seeking advertisers that may intensify the economic decline of the industry (Pew Project for Excellence in Journalism, 2008).

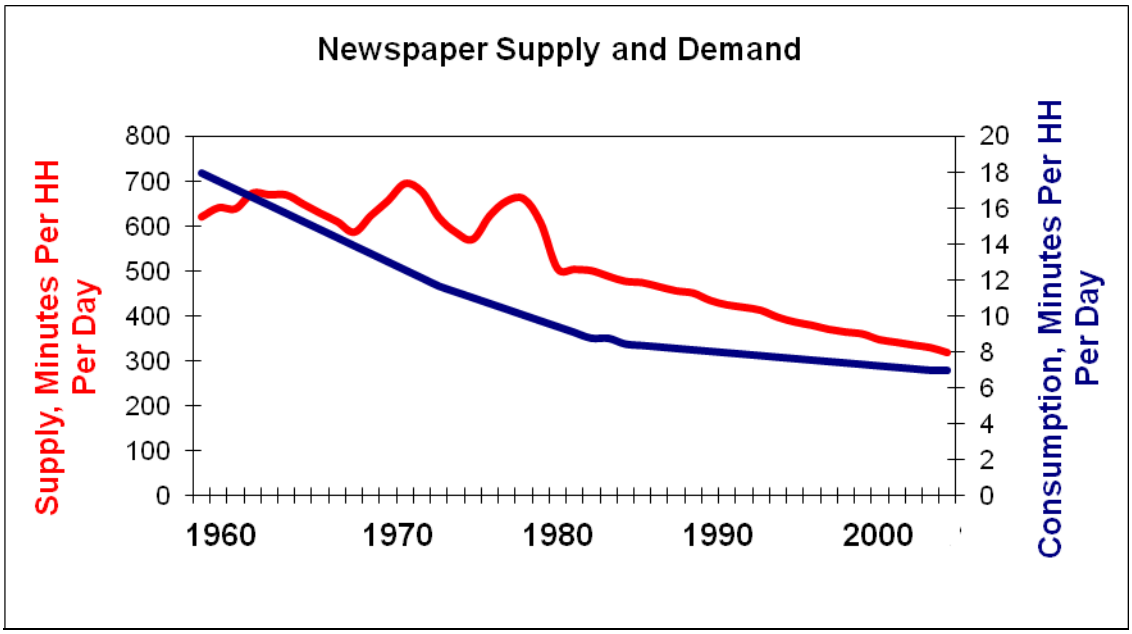

Figure 5. Newspaper Supply and Demand, 1960–2005.

Minutes Per Day

Figure 6 illustrates the dramatic and relatively recent growth of the Internet as an information and entertainment medium in the home. The left vertical axis in red records the percent penetration of Internet access (narrowband and broadband combined), and the right vertical axis in blue and the corresponding blue curve depict the levels of actual usage. The usage curves in minutes per day reflect the usage for all households, including those without Internet access, which are accorded 0 minutes per day of use. As mentioned above, the daily use of the Web in Internet-connected households is closer to 1 hour 30 minutes a day. So we find that in just a decade, Internet usage levels have already begun to compete with those of radio and television. We note, however, that this notion of "competition" will recede as it becomes less clear to users whether the video they are watching or the music they are listening to is being piped over traditional media or over the Internet.

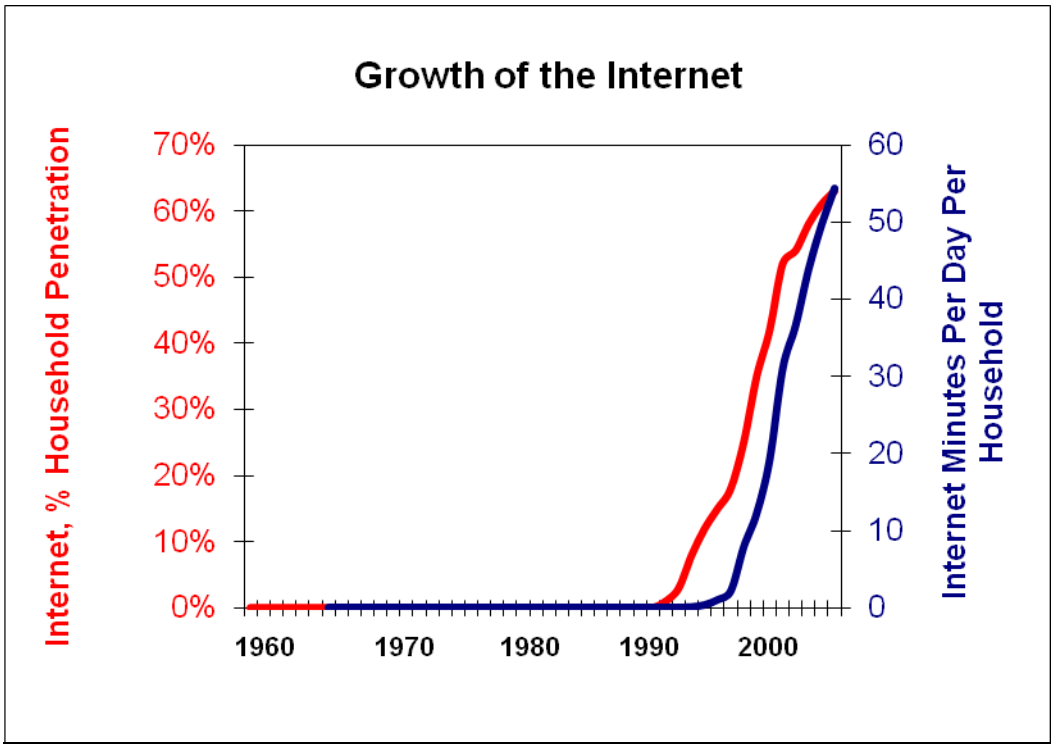

Figure 6. Growth of Internet Household Penetration and Minutes of Use, 1960–2005.

Figure 7 provides an overview of the growth in supply of the remaining traditional media and the Internet from 1960 to 2005. The traditional mass media of books, magazines, and movies hold their own against the growing competition in media supply. Recordings held strong but dipped in the last few years, apparently losing out to Internet-based competition (legal and otherwise). The interpersonal media of first-class postal communication and telephonic communication maintained a constant supply, though in the case of telecommunication a dramatic shift occurred from wireline to mobile communication, with an actual decline in wireline household use observable as of 2003 and accelerating after 2005. The evolving media of home video, portable audio, video games, and Internet each grew into significant sources of supply in the late 1980s and 1990s. We find that earlier studies only scratched the surface of an explosive pattern of growth of supply.

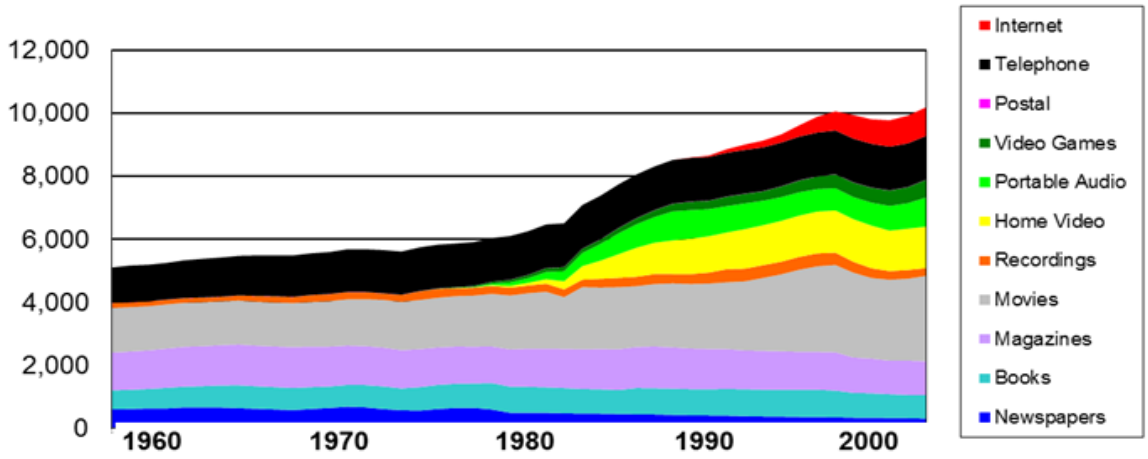

Figure 7. Media Supply to Homes in Minutes Per Day, 1960–2005. (Excluding TV and Radio.)

Figures 8, 9, and 10 summarize the preceding figures and allow us to begin to address our fundamental conclusion about the digital revolution. Figure 8 reviews the growth in supply to the average American household of all media as measured in available minutes of supply per day. Figure 9 depicts the measured growth in actual consumption—listening to the radio, watching a movie, reading a book. In both cases, there is growth: Supply approaches growth as an order of magnitude, while in the case of consumption, growth is modest and linear. People are spending more time with media and perhaps less time engaging with each other or sitting on the front stoop. This unsurprising observation is a central element of Robert Putnam's celebrated argument about declining social capital, though he focused primarily on television viewing (Putnam, 2000). Multitasking—reading a book while the TV is on, driving while talking on the cell phone and listening to the radio—also increased. Widely observed to be a fashionable youthful practice, multitasking merits serious further attention (Foehr, 2006), but our focus is on a related issue: the question of the ultimate limits to attention and the dynamics of media choice.

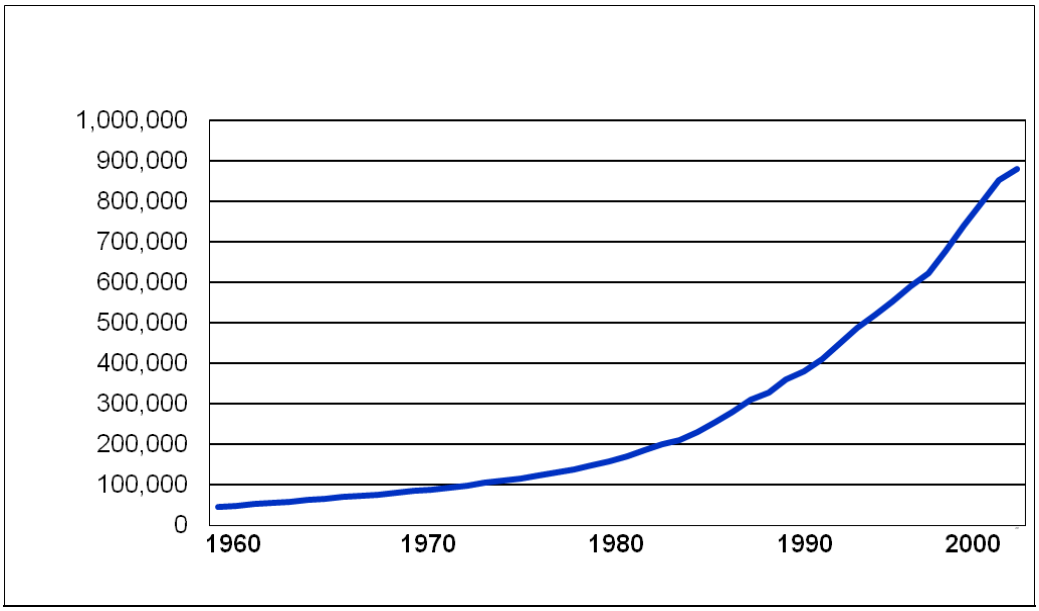

Figure 8. Total Media Supply to Homes in Minutes Per Day, 1960–2005.

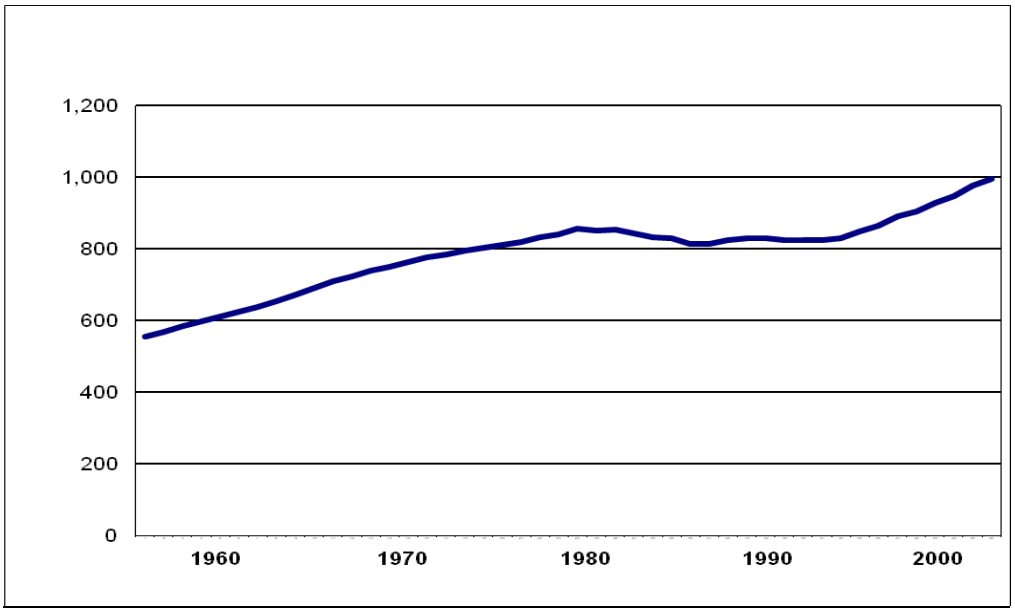

Figure 9. Total Media Consumption in Minutes Per Day, 1960–2005.

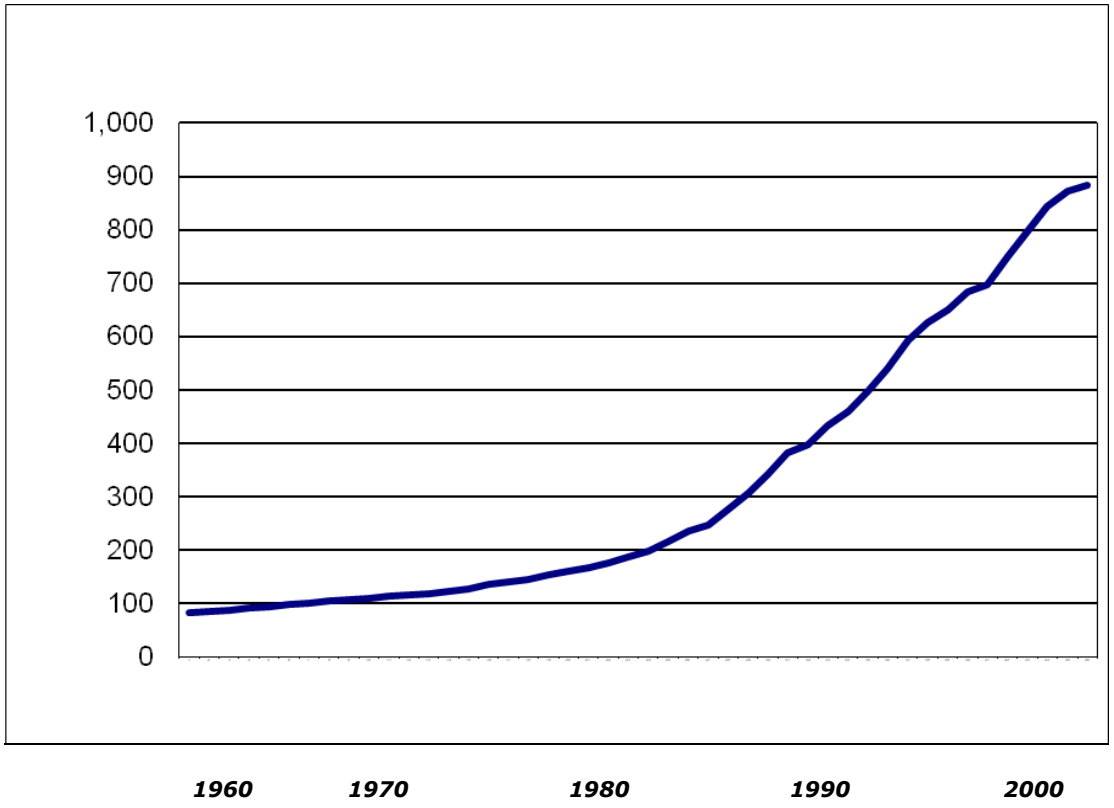

Figure 10. Ratio of Media Supply to Consumption in Minutes Per Day Per Household, 1960–2005.

Discussion

Our key conclusion is drawn from Figure 10, which represents yet another growth curve, in this case the simple ratio of media supply to media demand. Such a curve follows naturally from the disjuncture of an order of magnitude increase in supply paired with a modest linear growth in consumption. But it is worthwhile to pause briefly to consider the actual metrics we have been at some pains to calculate. Take the ratio of supply to demand in 1960. It is 82, that is, the number of media minutes available in the typical American household in 1960 divided by number of minutes of actual consumption. This represents the fundamental metric of choice—a human-scale choice. In 1960, there were typically 3.4 television stations available, 8.2 radio stations, 1.1 newspapers, 1.5 recently purchased books, 3.6 magazines, and so on. It was relatively easy to find the country music station, the public broadcasting station, and the rock station on the radio dial. With appropriate chunking, labeling (Miller, 1956), habitual behavior, and radio-button-setting (Papper et al., 2005), the human cognitive system can intuitively manage this choice situation.

But the ratio of supply to demand in 2005 presents a very different metric. The ratio is 884:1, approaching a thousand minutes of mediated content available for every minute available for consumption. In our view that is *not* a human-scale cognitive challenge. For help in sorting it out, humans inevitably turn to the increasingly intelligent digital technologies that created the abundance in the first place: search engines, TiVo's recommendation systems, collaborative filters (Adomavicius & Tuzhilin, 2005). We see this as a historical variant of Beniger's widely cited "crisis of control" in the 19th century (1986a, 1986b). In brief, Beniger argued that the growth of automated intelligent control systems in transportation and manufacturing was not just a technical artifact but a necessary development as the speed and complexity of mechanized processes challenged the individual human's capacity to control them. As a particularly dramatic exemplar he cites frequent train crashes resulting from human error in the late 19th century. The realm of media flows may not confront today's humans with equivalent drama, but it is nonetheless the site of a critical shift in how individuals will negotiate the mediated world.

Because this shift is a gradual process lacking the obvious urgency of rail accidents, its structural significance risks being underestimated. We forbear to use the term "crisis." Instead, we conclude that the media abundance has led from a dynamic of *push* to one we characterize as *pull*. In the traditional one-way broadcast and publishing media, the audience accepts that newspaper editors determine the headlines audiences will read, and that network executives decide which program is on at 8:00 p.m. This is push media. But in a world of approximately 1,000 choices for any given minute, audience members are less likely to passively wait to see what comes on at 8:00. They use the evolving technologies to pull what they want to watch and read.

This logic leads us to look to the search engine and to social media as increasingly defining the architecture of media access in the future. Google is widely acknowledged as an increasingly important factor in connecting potential customers with vendors online. To date, that status is the prime determinant of the company's celebrated market value, currently approaching $200 billion. Facebook is just getting into the game and is valued at a mere $4 billion dollars. What is now coming under appropriate scrutiny is how Google, Facebook, and similar portals to the broadband world will exercise their powers of control in

directing attention, cuing fashions in popular culture, and influencing public opinion and commonly held information in the future (Pariser, 2011).

As noted above, for practical purposes in this analysis we have treated the Internet as a single medium "competing" with traditional media, rather than as a digital gateway to all media sources. In recent years, Google was reportedly monitoring approximately 8.5 billion Web pages (Gulli & Signorini, 2005). The number now is certainly high enough to dwarf our calculations of words and minutes. As analysis of the "pull media" interface proceeds, we will need new metrics and must also rethink some of our most cherished theoretical tools in the study of media effects. Agenda-setting studies, for example, typically derive from comparison of public opinion with media headlines and broadcast lead stories (McCombs, 2005). Two-step flow analysis draws on opinion leadership from personal conversation rather than online mediated recommendation systems (Rogers, 1973). Much of media effects theory, upon examination, turns out to be premised on a notion of push media (Katz, 2001).

From these findings we conclude that the growth of the Web and the digitization of traditional media is not just another phase or technical refinement. Theories of media exposure and media effects need to be reexamined from first principles. We face not just a few more media channels, but a new media environment and, it appears, a fundamentally new interface between media and audience.

Our analysis, concluding with data for the year 2005, may be among the last that can be appropriately designed around measuring information flow by individual medium of delivery in the Pool tradition and calculating corresponding supply and demand within a single 24-hour period. For our purposes, counting the number of books printed or the number of television broadcasts transmitted on the VHF and UHF spectrum bands increasingly appears akin to estimating travel trends on the basis of horseshoe manufacturing data. A 2011 study concluded that only 8% of American households still rely exclusively on over-the-air broadcasts, with the great majority relying on cable, satellite, and broadband (Consumer Electronics Association, 2011). Further, industry data confirm that in 2012, just under half of American television households employ a DVR to convert at least part of the flow of programming to an on-demand mode capable of fast-forwarding through commercials (Multichannel News, 2012). The share of homes relying extensively or exclusively on broadband-delivered television and video is small, currently about 4%, but growing rapidly (Multichannel News, 2012).

As social scientists, we emphasize the human consumption of mediated communication in this study, focusing on minutes rather than bits. Most of the other studies in this collection, drawing on the traditions of computer science and engineering, focus on networks and technologies, counting the bits for storage and the bits per second for transmission. Our view is that both perspectives contribute to theory building. We need not seek a singular and exclusive methodological approach to measuring information stores and information flows.

The literature hints that despite the size of the digital cornucopia, people now devote their attention to an even smaller sliver of available information, with less diversity of sources and perspectives, than was consumed at the height of the dominant industrial-age push media of publishing and broadcasting (Hindman, 2009). Thus, the fundamental methodological (and theoretical) challenge ahead, as Lyman and Varian (2003) foresaw, is not just the measurement of information quantity but a meaningful assessment of information diversity.

Appendix 1. Volume of Demand Measurement Definitions

Each medium has a words-per-minute (wpm) factor for converting words to minute metrics from Pool
Reading speed average for U.S. adults is set at a constant of 240 wpm
Minutes = minutes per day
Pen = penetration as % of U.S. households in which a medium is available

1. Television (153 wpm avg)
    1.1. Broadcast
        1.1.1. no. bcast stations per avg market * avg % bcast hours day * TVs per household * pen
    1.2. Cable (153 wpm avg)
        1.2.1. avg channels per cable household (assume 24 hr) * cable TVs per household * pen
    1.3. Satellite (153 wpm avg)
        1.3.1. avg channels per sat household (assume 24 hr) * sat TVs per household * pen
2. Radio
    2.1. Broadcast (48 wpm avg)
        2.1.1. avg stations per market * avg bcast hours per day * radios per household * pen
    2.2. Satellite
        2.2.1. no. channels * pen
3. Newspaper
    3.1. circulation per household * avg number pages [daily and weekly]
4. Books
    4.1. books purchased per household * avg book size
5. Magazines
    5.1. magazines per household * avg magazine size [subscription and newsstand]
6. Theatrical Motion Picture (110 wpm avg)
    6.1. number screens avg market
7. Recordings (41 wpm avg)
    7.1. Records
        7.1.1. recordings sold per household
    7.2. Cassettes
        7.2.1. recordings sold per household
    7.3. CDs
        7.3.1. recordings sold per household
8. Video (153 wpm avg)
    8.1. VCR
        8.1.1. pen
    8.2. DVD
        8.2.1. pen
    8.3. DVR
        8.3.1. pen

9. Portable Audio (41 wpm avg)
    9.1. pen
10. Video Games
    10.1. pen
11. Postal
    11.1. First-Class Mail
        11.1.1. avg no. letters per household * avg letter length
    11.2. Direct Mail
        11.2.1. avg no. letters per catalogs per household * avg letter length
12. Telephone
    12.1. Wireline
        12.1.1. pen
    12.2. Cellular
        12.2.1. pen
    12.3. IM
        12.3.1. pen
13. Internet
    13.1. Dial-up
        13.1.1. pen
    13.2. Broadband
        13.2.1. pen
    13.3. WiFi
        13.3.1. pen

Appendix 2. Volume of Demand Measurement Definitions

These vectors are averages for all households (HH), so penetration is built into measures. (In the future, measures of use for only HH with medium may be calculated.)

1. Television—mins. viewing per person and per HH
2. Radio—mins. viewing per person and per HH
3. Newspaper—mins. reading per person and per HH
4. Books—mins. reading per person and per HH
5. Magazines—mins. reading per person and per HH
6. Theatrical Motion Picture—mins. at movie theater per person and per HH
7. Recordings—mins. listening per person and per HH
8. Video—mins. viewing per person and per HH
9. Portable Audio—mins. listening per person and per HH
10. Video Games—mins. playing per person and per HH
11. Postal—mins. all First-Class Mail, fixed percent of Direct Mail and Catalog
12. Telephone—mins. usage
13. Internet—mins. Usage

Appendix 3. Primary Data Sources

Arbitron
Ball State University Center for Media Design
Consumer Electronics Association
CTIA - The Wireless Association
Federal Communications Commission
Magazine Publishers of America
Motion Picture Association of America
National Cable and Telecommunications Association
Newspaper Association of America
Nielsen
Pew Internet and American Life Project
Pool, Inose, Takasaki, & Hurwitz 1984 Data Appendix
R. R. Bowker
Recording Industry Association of America
Robinson Time Budget Studies
SNL Kagan
University of Southern California
U.S. Census Bureau
U.S. Postal Service
Veronis Suhler Stevenson

References

Adomavicius, G., & Tuzhilin, A. (2005). Toward the next generation of recommender systems: A survey of the state-of-the-art and possible extensions. *IEEE Transactions on Knowledge and Data Engineering, 17*(6), 734–749.

Bell, D. (1979). The social framework of the information society. In M. Dertouzos & J. Moses (Eds.), *The Computer Age* (pp. 163–211). Cambridge, MA: MIT Press.

Beniger, J. (1986a). *The control revolution: Technological and economic origins of the information society*. Cambridge, MA: Harvard University Press.

Beniger, J. (1986b). The information society: Technological and economic origins. In S. Ball-Rokeach & M. Cantor (Eds.), *Media, audience and social structure* (pp. 51–70). Beverly Hills, CA: SAGE Publications.

Blumler, J. (1980). Information overload: Is there a problem? In E. Witte (Ed.), *Human aspects of telecommunication* (pp. 229–263). New York, NY: Springer-Verlag.

Consumer Electronics Association. (2011, May 31). *Consumers are tuning out over-the-air TV*. Retrieved from http://www.cesweb.org/shared_files/ECD-TOC/CEACordCuttingAnalysis.pdf

Dupagne, M., & Green, J. (1996). Revisiting the principle of relative constancy: Consumer mass media expenditures in Belgium. *Communication Research, 23*, 612–635.

Eppler, M., & Mengis, J. (2004). The concept of information overload: A review of literature from organization science, accounting, marketing, MIS, and related disciplines. *The Information Society, 20*, 325–344.

Foehr, U. (2006). *Media multitasking among American youth: Prevalence, predictors and pairings.* Menlo Park, CA: Kaiser Family Foundation.

Gitlin, T. (2002). *Media unlimited: How the torrent of images and sounds overwhelms our lives*. New York, NY: Owl Books.

Gulli, A., & Signorini, A. (2005). The indexable Web is more than 11.5 billion pages. *Proceedings from 14th international conference on World Wide Web*, 902–903. Chiba, Japan: ACM Press.

Hindman, M. (2009). *The myth of digital democracy.* Princeton, NJ: Princeton University Press.

Katz, E. (2001b). Media effects. In N. J. Smelser & P. B. Baltes (Eds.), *International encyclopedia of the social & behavioral sciences* (pp. 9472–9479). Oxford: Elsevier.

Lyman, P., & Varian, H. R. (2003). *How much information?* Berkeley, CA: University of California Press.

Machlup, F. (1962). *The production and distribution of knowledge in the United States*. Princeton, NJ: Princeton University Press.

McCombs, M. (1972). Mass media in the marketplace. *Journalism Monographs*, *24* (August), 1–104.

McCombs, M. (2005). The agenda-setting function of the press. In G. Overholser & K. Hall Jamieson (Eds.), *The Press* (pp. 156–168). New York, NY: Oxford University Press.

Meyer, P. (2004). The vanishing newspaper: Saving journalism in the information age. Columbia, MO: University of Missouri Press.

Miller, G. (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychology Review*, *63*, 81–97.

Miller, J. (1960). Information input overload and psychopathology. *American Journal of Psychiatry*, *116*, 695–704.

Multichannel News. (2012). Viewer watch: Annual report on consumer behavior. New York, NY. Retrieved from http://www.multichannel.com/article/478395-What_Viewers_Really_Want.php

Neuman, W. R., & Pool, I. S. (1986). The flow of communications into the home. In S. Ball-Rokeach & M. Cantor (Eds.), *Media, audience and social structure* (pp. 71–86). Beverly Hills, CA: SAGE Publications.

Papper, R., Holmes, M., Popovich, M., & Bloxham, M. (2005). *Middletown media studies.* Muncie, IN: Ball State University Center for Media Design.

Pariser, E. (2011). *The filter bubble: What the Internet is hiding from you*. New York, NY: Penguin Press.

Pew Project for Excellence in Journalism. (2008). *The State of the news media: An Annual Report on American Journalism 2008.*

Pool, I. S. (1983). Tracking the flow of information. *Science, 211*, 609–613.

Pool, I. S., Inose, H., Takasaki, N., & Hurwitz, R. (1984). *Communications flows: A census in the United States and Japan*. Amsterdam, Netherlands: Elsevier North Holland.

Porat, M. U. (1977). *The information economy*. Washington, DC: U.S. Government Printing Office.

Putnam, R. (2000). *Bowling alone: The collapse and revival of American community*. New York, NY: Simon & Schuster.

Robinson, J., & Godbey, G. (1997). *Time for life: The surprising ways Americans use their time*. University Park, PA: Pennsylvania State University Press.

Rogers, E. (1973). Mass media and interpersonal communications. In I. D. S. Pool & S. Wilbur (Eds.), *Handbook of communication* (pp. 290–310). Chicago, IL: R. McNally.