

Re-Examining the Digital Divide

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Much media and public policy attention has been attended to a presumed “Digital Divide.” This refers to those who have access to information tools and the capability of using information and those who presumably do not. This paper looks at the forces and trends in the information technologies themselves and the economics of information. It concludes that the divide at its outset was much the same as many gaps that have and continue to persist in a capitalistic society. It further concludes that costs are falling so steeply and ease of use improving so rapidly that market forces already seem to me eliminating the greatest portion of the divide. Policy-makers may have less of an issue to deal with in a few years than seemed likely just a few years ago.

Disraeli observed that “as a general rule the most successful man in life is he who has the best information.”¹ In an Information-Intensive Economy not having access to this information may be considered to be a handicap. According to some versions of the scenario, those who have access will further their distance from those who do not.

The Digital Divide popularly refers to the perceived gap between those who have access to the latest information technologies and those who do not. It has been applied to differences within a society, such as the United States.² It may also be applied to differences between developed and developing or under-developed countries.³ Although there is some commonality between the two applications of the term, there are significant differences in policy responses and well as players and stakeholders. This paper refers to differences within the United States.

The topic of what should be public and private responses to the digital divide has taken precedence over what is or should be measured in determining a divide. But only by first addressing the latter can policy-makers substantively debate whether there is indeed a chronic

divide or simply a short term gaps which, like television or VCRs, quickly disappeared through natural forces.

The Digital Divide notion is a new label for a similar concept of the previous generation: information haves and have-nots. And this concept owes much to an even earlier construct that goes under the universal service rubric. The term “universal service” dates back at least to 1907 when Theodore Vail, then president of AT&T, used the phrase to refer to his desire to interconnect the highly fragmented local telephone companies into a single nationally interconnected system. The universal service provider would be AT&T.⁴ The more modern concept of universal service was that of providing telephone service for everyone. That re-definition can be traced to the Communications Act of 1934, which directed the newly created Federal Communications Commission (FCC) to “make available, so far as possible, to all people of the United States, a rapid, efficient, nationwide and world-wide wire and radio communication service with adequate facilities and reasonable charges.”⁵ Notions of the federal government being responsible for providing digital access to all Americans is therefore derived as an extension of the “telephone gap” of the 1930s. It ultimately led to the phenomenon of nationwide averaging of telephone rates. That is, residential phone users paid roughly the same for a given level of local telephone service regardless of the cost of providing that service. Thus, residential users in communities that were relatively inexpensive to serve, such as high density urban areas where there may be hundreds or even thousands of subscribers in a square mile, were generally charged more by the phone companies – with the urging and blessing of the state regulators -- than the cost of providing the service. This excessive “profit” helped subsidize subscribers in low density areas – such as suburban and rural areas. Here there might be dozens or fewer subscribers in square mile.

What Are the Stakes in the Digital Divide?

Whether one buys in to the notion of a digital divide with substantial societal consequences is not of simply intellectual curiosity. It has very substantial economic and political implications: from the taxes on telephone service that are targeted to fund remedies in rural areas and poor neighborhoods to the broader skills that will be available in the work force. When President Clinton asked Congress for \$50 million to provide computers and Internet access for poor families in his State of the Union address in 2000, that had political ramifications.⁶ The same for his proposal for \$2 billion in tax incentives for digital divide-inspired programs.⁷ When the chairman of the Federal Communications Commission makes proposals to Congress and his fellow commissioners for legislation and rules, that is a political process.⁸ Clearly the political players have raised the stakes.

This filters down to the costs. The specific costs are those taxes on telephone bills that are earmarked for digital divide subsidies. This includes the Universal Service Fund Fee. This is a charge to telephone companies that they typically pass on to their customers. As of April 2000, MCI, for example, was adding a 10% surcharge to the bills of their interexchange phone customers. In 2000, the FCC was requiring telecommunications carriers to contribute nearly 6% of their interstate and international calling revenues to subsidize schools and rural areas, an amount well in excess of \$4 billion.⁹ The economic stakes are considerable

There are the human stakes. Access to the information available from networked devices may be critical in the education process – for both teachers and students. It could be useful in finding and improving jobs. It is already part of the routine of everyday life. But will the stakes be as high as some prognosticators proclaim? FCC chairman Kennard wrote “The high skilled, well-paid jobs of tomorrow demand the ability to use computer and telecommunications.”¹⁰

The Boundaries of the Digital Divide

The Digital Divide also has changing connotations. In the original iteration of the National Telecommunications and Information Agency (NTIA) survey¹¹ it meant primarily personal computer ownership. In its follow-up surveys it has come to incorporate Internet access.¹² By 2000 it seemed to incorporate access to high speed (broadband) access from slower dial-up modem access. In effect, it may be a moving target.

The term “digital divide” achieved mass media attention when it became part of the title of the second NTIA survey in 1998. Donna Hoffman and Thomas Novak credit Lloyd Morrisett, at the time President of the Markle Foundation, with coining the term.¹³

Although the goal of universal service was to make access to a dial tone affordable to all, it was never extended to incorporate subsidies for the actual *use* of the telephone. That is, long distance calls were, until well after the breakup of AT&T in 1984, priced well above cost to further help subsidize local basic service. Information that could be accessed by phone – from time and weather to pay per call services such as 900 exchange calls – were not part of the universal service contract. But the digital divide debate has included some component of the cost of information that could be available online.

Thus there is the question of whether the cost of *information* should be part of the policy debate of the digital divide. If in fact there a disadvantaged population on the short end of the divide, is providing hardware and access enough? Or should there be a provision to, in effect, subsidize the digital equivalent of newspapers, magazines and books? If so, where would one draw the line between information and entertainment? Much of what is available on cable and DBS, on newsstands and online is reasonably characterized as content for entertainment. If public policy makers wanted to make content available to some disadvantaged groups, should they or could they differentiate between public affairs that might be useful to the body politic and the digital equivalent of “Beverly Hillbillies” reruns?

Evolution of the Issue

Before there was a “digital divide” issue there was the “information haves and the have-nots” issue. Commentators started making references to a need for access to personal computers almost as soon as the first school anywhere installed an Apple II in 1980. By 1983 a survey found that two-thirds of the schools in the wealthiest school districts had personal computers, compared to two-fifths in the poorest districts.¹⁴

The first high profile survey by the federal government to address the have and have not issue was initiated in 1994 by the NTIA within the U.S. Department of Commerce.¹⁵ That was the year that the World Wide Web got its first national attention, as Netscape commercialized an early graphical interface, the Mosaic browser. Although the Internet traces its origins to 1968 and the World Wide Web to 1991, they remained the relatively obscure preserve of academics and defense contractors until the graphical browsers made the Web user friendly. Thus, it is not surprising that the NTIA I survey, “Falling Through the Net” all but ignored Internet access. “Net” referred to the safety net, not the Internet. “Internet” was mentioned twice, once in an endnote to the first reference. The Web was only mentioned in that same endnote. Its focus was on access to telephone service, personal computers, and modems. In 1994 PCs with modems were for the most part still used to connect to proprietary online services, such as CompuServe, Prodigy and American Online.

NTIA I reported that the poorest households had the lowest telephone, computer and modem penetration. But it further subdivided the poor by where they lived: rural, central city and urban, as well as by racial and ethnic group, age and education. There were a few noteworthy twists for those willing to mine the data. One was that telephone penetration was higher among the rural poor than among the central city poor. The paradox is that telephone rate cross subsidies have long been aimed at “overcharging” urban subscribers to subsidize rural subscribers, regardless of income.

Hoffman and Novak focused on the most recent Web users.¹⁶ Among their findings was that there were few, if any, differences between whites and African Americans. They also noted that rates of cable and satellite dish penetration among African Americans was increasing dramatically, making that group better prospects than whites for high speed Internet access.

The NTIA III report, "Falling Through The Net: Defining The Digital Divide" found that although penetration rates for computers and Internet access had risen across all demographic groups and geographic areas, "...penetration levels currently differ -- often substantially -- according to income, education level, race, household type, and geography, among other demographic characteristics."¹⁷ Though not reported in the text, the data did suggest that the rate of computer and Internet access were increasing most rapidly among those groups that were most prominently on the negative side of the "divide" in its previous studies.

Neither the NTIA studies nor those of Hoffman and Novak have used statistical measures to determine the significance of the differences in their findings among groups. They have not employed analysis of variance or similar measures that can help factor out the spurious from the valid factors (e.g., ethnicity, income, education, age, gender, etc.) that can help us know which factors really matter.

In 1999 about 6% of household did not have wired telephone service.¹⁸ But the reason for not having basic service is not always purely economic. With various subsidies that make it possible to have phone service for as low as \$4 or \$5 monthly, one would reason that there is little excuse not to be at 100% penetration. Schement and Mueller interviewed households without telephone service in a low income neighborhood of Camden, NJ.¹⁹ They found that at least some proportion of these non-subscribers choose not to be connected. In some cases it was because they would prefer to spend their money on the high entertainment value of a more expensive cable subscription than a telephone connection. In other cases it was because they

feared they would run up sizeable monthly long distance bills if the phone were too convenient. They concluded that it was often the use of the telephone beyond basic local service that caused concern, not the cost of access itself. Thus, some gaps may be self-imposed.

In the debate over what should be included in the expanded concept of universal service, Compaine and Weinraub differentiate between access to an infrastructure and access to content.²⁰ For example, while cross subsidies helped make basic residential dial tone service priced lower than real cost, they could find no serious proposals to subsidize 900 services that charge for horoscopes or sports scores. They noted that though public funds have made books available in libraries and for many decades subsidized postal rates for magazines, U.S. policy has not provided newspaper or magazine subscriptions nor book purchases for the less well off economically. So in the debate of online access, what, if anything, might be subject to some sort of need-based subsidy: the hardware needed for access: the ability to connect to the Internet or the cost of services available online?

The Current Study

The sum of the historical context of the recent surveys documenting a digital divide are often unclear about what services or substance is involved in determining any “divide.”

Nor is it always clear what the fault line is for a divide: income, ethnicity or race, gender, all of these, any of these? Even the oft cite NTIA reports include data that run counter to their basic conclusions in that the groups that had the largest gaps are catching up, based on the rate of change in Internet access.

Technologies in general and information technologies in particular are being developed and implemented at historically unprecedented levels. Those who are motivated to learn about the impact of information technology quickly discover the mantra: smaller, faster, cheaper, better. That is, anything touched by silicon – the raw material of computer chips – has been impacted by Moore’s Law since the development of the microprocessor.

What much of the research data lacks in the attempted documentation of a digital divide is recognition of the consequences of the forces and trends shaping the information landscape, particularly the economics of the Internet and computers. The next part of this paper addresses this particular gap.

The Economics of Online Access: In Brief

The economics of online involve the consumer's capital cost — equipment and its upkeep — and the operating costs — subscription and connection fees. Socio-cultural factors address the McLuhanesque nature of screens versus paper, keyboards or dictation versus pens and pencils. The two have some relationship: if wireless connections and paper-like reading devices are economical (we know they are technologically feasible), then some of the socio-cultural nuances could be diminished.

This paper highlights the economics of online to suggest where the technology could go next. For some discussion of the social and cultural nature of online, see Compaine's "The New Literacy" as well as the work of Sherry Turkle, among others.²¹

Consumer costs

There is a cost to consumers even when the content is "free." Users must pay, in some form, for any information they access via the media. For broadcast television and radio, the direct cost is periodic investment in television and radio receivers, antenna, and occasional repairs.²² Readers, listeners and viewers must subscribe to newspapers and magazines, purchase books and records, subscribe to cable, rent videos or a pay-per-view showing. Table 1 identifies examples of the monthly costs of some of these media. Consumer spending on media was estimated to be an average of more \$49 per month per person in 1999, not including online access.²³

The average household had 2.4 television sets and 5.6 radios in 1996.²⁴ More than 84% of households had videocassette players, four times the penetration of 10 years earlier.²⁵

Table 1
Monthly and Capital Cost of Traditional Media, 1999-2000

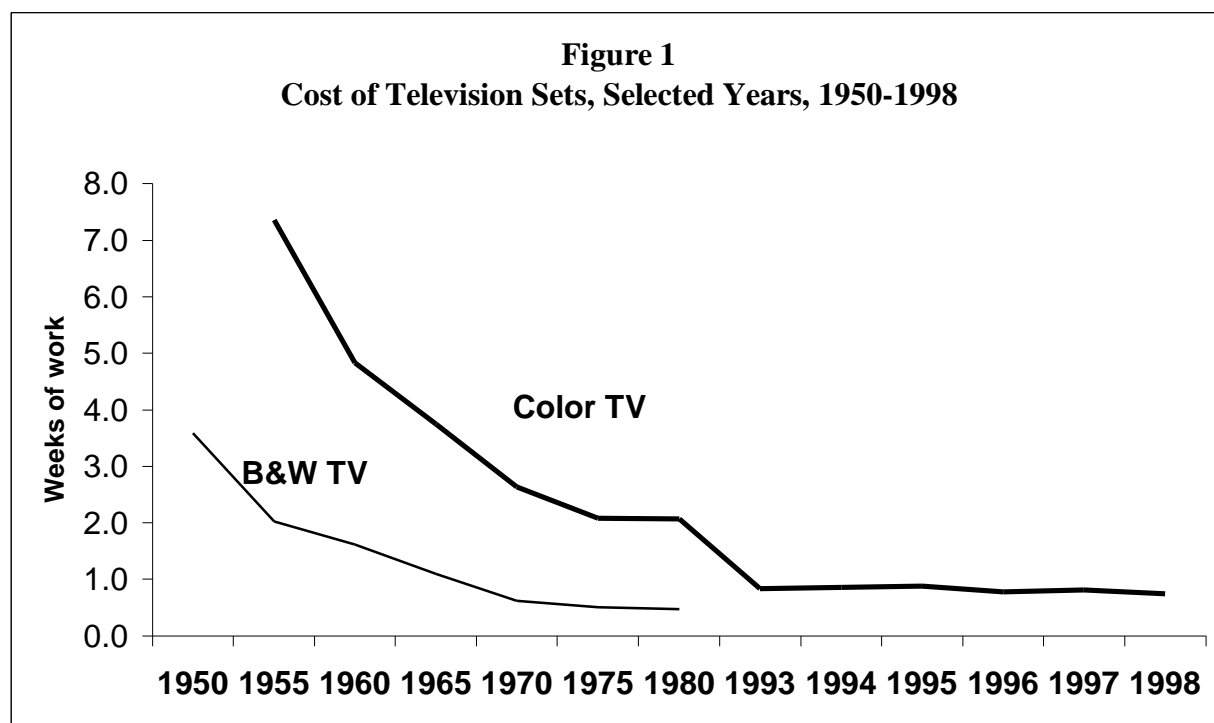
<u>Medium</u>	<u>Monthly Cost</u>	<u>Capital Cost</u>
Daily newspaper subscription		
<i>Atlanta Journal & Constitution</i>	\$17	\$0.00
<i>Pottstown (PA) Mercury</i>	14	
<i>The Wall Street Journal</i>	15	
<i>USA Today</i>	10	
Cable Television, standard tier	\$31 (1998 national ave.)	\$250 (per 27" TV set)
Home Box Office	9.95	
Pay per view movie	3.95	
Pay per view special event	19.95 and up	
Direct Broadcast Satellite	\$29.99 (2000 DirecTV Total Choice)	\$0 - \$99 for dish and one receiver \$250 (per 27" TV set)
Books		
<i>Bag of Bones</i> , Stephen King	\$28 list, \$19.60 discount	\$0.00
<i>Technologies of Freedom</i> , Pool	16.50 (paper)	
<i>Silver Palate Cookbook</i>	\$25 list, \$17.47 discount	
<i>U.S. Statistical Abstract</i>	\$50 (paper)	
<i>Babe--The Gallant Pig</i>	\$5 list, \$4 discount	
Magazine subscription		
<i>PC Magazine</i>	\$2.90 (2 issues)	\$0.00
<i>Fortune</i>	5.00 (2 issues)	
<i>The Atlantic Monthly</i>	1.25 (1 issue)	
<i>Time</i>	4.30 (4.3 issues)	
<i>Consumer Reports</i>	2.00 (1 issue)	
Ave. total per consumer spending on all media	\$49.43	

Sources: Newspapers— From each newspaper’s Web site, February 10, 1999, Cable — Seth Schiesel, “FCC Notes Lack of Cable TV Competition,” *The New York Times Interactive*, January 14, 1998. Magazines — from Web sites, Feb 11, 1999. Books — from Amazon.Com, February 10, 1999. DBS— from DirecTV price list at Web site, May 3, 2000 and Parade Magazine ad for Dish Network, May 7, 2000; Hardware cost -- from Best Buy advertisement, May 7, 2000. Total per consumer: See Note 16.

Overall, consumers increased the proportion of their personal consumption expenditures on media from 2.5% in 1980 to 2.9% in 1996.²⁶

Just as consumers had to buy radios, phonographs, televisions and VCRs to make use of previous waves of new media technologies, to make use of online media they must have have

access to other devices. Initially these were personal computers but supplemented by less expensive options such as dedicated TV set-top boxes. One brand was WebTV, a Microsoft subsidiary that used the TV set as the display.²⁷ Another option, Netpliance's I-Operner, a dedicated Web browsing and e-mail device, sold for \$399.²⁸ From home, consumers must



Sources: Television set prices, 1950-1976: Christopher Sterling and Timothy Haight, *The Mass Media: Aspen Institute Guide to Communications Industry Trends*, New York: Praeger Publishers, 1978) pp 360-362. 1979-83: *U.S. Statistical Abstract*, 1985, p. 777, from *Merchandising, 62nd Annual Statistical and Marketing Report*. 1993-1996: US Bureau of the Census, Current Industrial Reports, Manufacturing Profiles, annual. Wages: U.S. Bureau of Labor Statistics, *Employment and Earnings*.

have telecommunications access to the Internet, via a telephone line, cable wire, or wireless.

Figure 1 looks at the costs of television sets from 1950 to 1998. The measurement is in number of weeks of work at the average weekly pay for private sector wage earners. In essence it shows that the first television sets were expensive: equal to 3.6 weeks of earnings. By the late 1990s, the cost had declined to under four days of work. Meanwhile the quality improved as well. From nine inch black and white screens with high maintenance tubes to 27" and larger

solid state color and remote control, the cost by any measure fell continuously and substantially throughout the decades.

The cost of the hardware associated with online information has followed even a steeper declining curve. Figure 2 charts one of the measures of computer costs over the decade of the 1990s, the decline in computer processing costs. It is consistent with Moore's Law.²⁹ Moore's observation described a trend that has been maintained for at least 35 years. It is the basis for many planners' performance forecasts. In 26 years the number of transistors on a chip had increased more than 3,200 times, from 2,300 on the Intel 4004 in 1971 to 7.5 million on the Intel Pentium II processor that was the standard in 1999.³⁰ Meanwhile, other components also decreased in cost while increasing in capacity: mass storage, modems, CD-ROMs drives, even monitors. Between 1996 and 1998 alone the retail cost of personal computers fell nearly 23% annually.³¹ This brought the retail price of Web-ready full-featured (for that date) personal computers to about \$600 or about 1.4 weeks of average weekly earnings. This was a level not reached for color television sets until the mid-1980s. By 1999 multiple vendors offered Web-enabled PCs for free. They were provided in return for recipients providing personal demographic information or willingness to be exposed to added advertising as they use the Web.³² Or they are provided to consumers willing to sign a long term contract with an Internet Service Provider.³³

Table 2 shows examples of the costs associated with access to the Internet in 1999. Based on historical trends, the capital cost of hardware is likely to continue to decrease in both current and real dollar terms, as is the cost of access fees. The cost of information is likely to stay constant or decrease as the audience online expands.

<p>Table 2 Capital and Operational Costs for Consumer Internet Access, 1999</p>
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Access device:	Street cost
Personal computer*	\$848
Dedicated Web device**	\$399
Dedicated e-mail device***	\$100
Internet Service Providers:	Monthly cost:
America Online	\$21.95 unlimited use
	19.95 with annual contract
	4.95 for 3 hours + 2.50/hour
juno.com	\$0, basic service
	8.95, premium service
MediaOne.Net — cable	29.95 unlimited for cable subscribers
	39.95 for non cable subscribers
Telocity 640kps DSL	\$49.95, free modem

Telephone charges

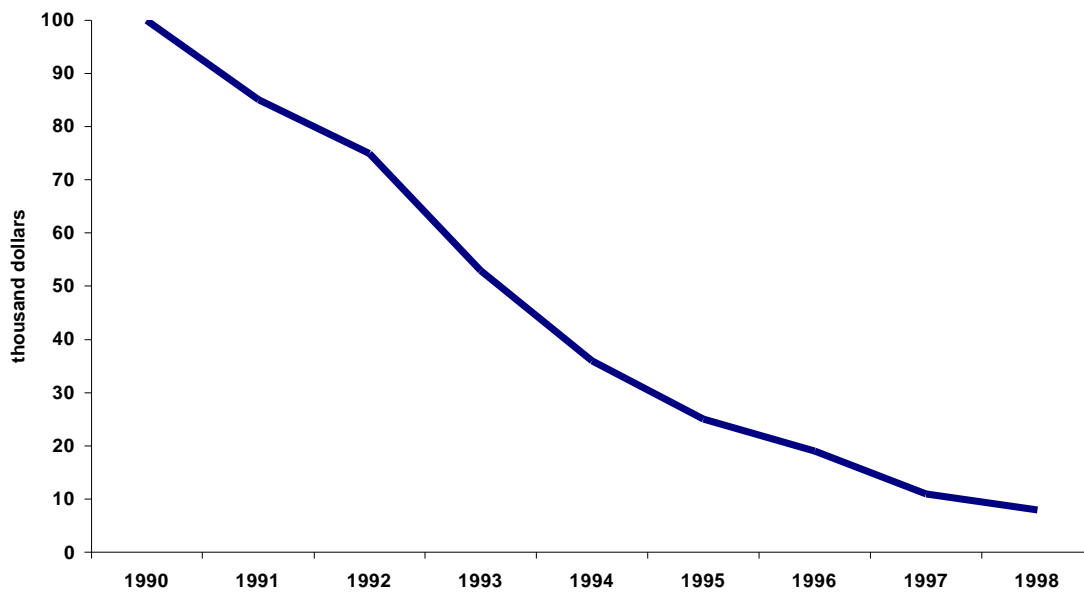
Varies depending on service level and location. None if using flat rate (nonmeasured) service to local POP. May be one to two cents per minute for measured service or more for more distant POP.

Internet-accessed Content Providers	Monthly cost:
<i>The Atlanta Journal-Constitution</i> online	\$0.00
<i>The Mercury (Pottstown, PA)</i>	0.00
<i>The Wall Street Journal Interactive</i>	5.00
<i>USA Today</i> online	0.00
ZDNet (includes PC Magazine & others)	0.00
<i>U.S. Statistical Abstract</i>	0.00
<i>Consumers Report</i>	2.00
<i>Time, Fortune, Newsweek</i>	0.00

*HP Brio 200, 64 mb w/ CD- ROM, 56K modem, 15" monitor. PC Connection catalog, v. 221, April 2000.

**Netpliance, with keyboard and display, www.netpliance.com, August 9, 2000.

*** Mailstation. Monthly access was \$8.33 on annual contract. <http://www.mailstation.com>, August 11, 2000.

Figure 2--Cost of MIPS, 1990-1998

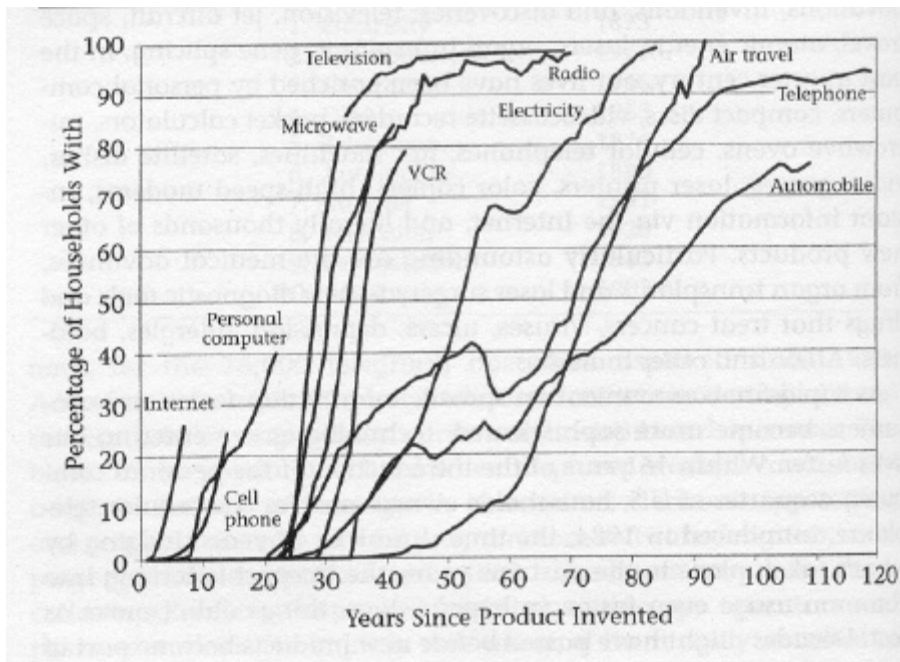
Source: Eva Freeman, “No More Gold-Plated MIPS: Mainframes and Distributed Systems Converge,” *Datamation*, March 1998. Data from Hitachi Data Systems.

Adoption of Technologies

Figure 3 compares the rate of Internet adoption to other popular technology-created goods and services, including the personal computer. It is based on the “invention” date of the graphical browser, rather than the initial implementation of ARPANet, the predecessor of the Internet.

The rate of adoption for the Internet and PCs is historically unprecedented compared to radio, television, VCRs or microwave ovens. Of the 11 products in Figure 3, two (electrification and telephone) relied on direct government programs to targeted populations to help with those on the margin.

Figure 3- Rate of Household Adoption of Selected Products
(Years since invention)



Source: W. Michael Cox and Richard Alm, *Myths of Rich & Poor* (New York: Basic Books, 1999), p. 162.

Factors in Internet and PC Adoption Rate

The rate of adoption of personal computers and the Internet had been stimulated by at least five trends: rapidly declining costs and increasing power of the hardware; improving ease of use; increasing availability of points of presence (POPs) for local Internet Service provider access; decreasing cost of Internet access; and network externalities associated with e-mail and chat.

- Rapidly declining costs and increasing power of the hardware. Figure 2 best measures this phenomenon based on the cost of computer capabilities. The difficulty in directly graphing the decline in computer cost alone is that capabilities and features have been increasing while absolute prices have declined.

For example, an Apple II+ personal computer with an 8-bit central processing unit (CPU), running at 1 MHz, with 64 kb of memory, two floppy drives that each stored about 160,000 bits and a crude monochrome monitor sold in 1981 for about \$3000.³⁴ A 300 baud modem added

later cost \$300. Word processing and the VisiCalc spreadsheet were the two useful applications.

In 2000, \$1700 bought a personal computer running a 32-bit Pentium III CPU at 800 mHz, with 128mb (that's 2000 times more memory), 13.6 gb of hard disk storage, a 17" high resolution color monitor, a 56 kps modem and a host of other features that did not even exist for PCs in 1981: sound and speakers, 100 mb removable mass storage, CD drive, and so on.³⁵

This is the high end and far more than most households need. Dell Computer, for example, offered a quite capable PC system for \$779 that included a year of Internet access as well as Microsoft word processing and spread sheet software. As has been noted previously, various specialized devices for Web only or dedicated e-mail use became available for as low as \$99. There is every reason to expect the declining cost curve to continue in hardware.

- Improved ease of use, via Apple Macintosh and Microsoft Windows "point and click" operating systems.

Before the graphical user interface (GUI), operating a PC took a certain determination and level of learning that most casual users found to be on the losing end of the cost-benefit equation. The breakthrough of point-and-click, first developed by Xerox then implemented in the Apple Macintosh and later Microsoft Windows, greatly lowered the technical barriers to entry. Similarly, the original Internet and first iteration of the World Wide Web were character based, meaning they required lots of typing of commands to make things happen. It was not until the Mosaic browser was popularized by Netscape in 1994 that the Web and with it the Internet became transparent enough to interest a mass, nontechnical audience.

The next breakthrough in ease of use, just starting to fulfill a long-held promise, is reliable voice recognition. In 1999 several programs became available for under \$100. Combined with ever more capable computers, voice recognition will further lower the skill

level required to access information, create documents and otherwise perform functions that have heretofore required some modicum of skill in operating a keyboard and mouse.

- Increasing availability of points of presence (POPs) for local Internet Service provider access.

At the end on 1999 there were 5078 Internet Service Providers in the United States, up 233 from a year earlier. These were the “on and off ramps” for the Internet. Among these, 184 were considered “national” ISPs by virtue having a presence in more than 25 area codes.³⁶ By the Spring of 1998 –barely four years after Netscape introduced the Web to the mass audience, 92% of the U.S. population had access by a local phone call to seven or more ISPs. Fewer than 5% had no access by other than a toll call.³⁷ As might be expected, the few areas that are underserved tended to be in lower population – primarily rural – counties.

- Decreasing cost of Internet access.

Only 2.55% of the population lived in counties with three or fewer ISPs, while more than 85% of the population lived in or adjacent to counties with 21 or more competitors.³⁸ Greater competition is generally associated with lower prices and higher quality of services.

Meanwhile, several services have developed business models that offered no charge to consumers. In 2000 these include Juno.com, NetZero.com and Bluelight.com. The latter claims that it offers local access to 96% of the U.S.³⁹

In 1996 AT&T Worldnet introduced the first flat rate unlimited use consumer ISP service for \$19.95 per month. Previously most services, such as America Online, charged about \$9.95 for only five hours of use, then a per hour rate, typically \$2.50. After Worldnet, most services followed suit at similar prices. Popular services charged \$20-22 per month in 2000, with some as low as \$8.95, as well the advertiser supported free services. Discounts of 10% or more were often available for yearly contracts.

- Network externalities associated with e-mail utility.

Network externalities refers to the increase in value to all users of a network as more users join the network. When only a few businesses and households had telephones, they were of limited value. The postal network, by contrast, was of great value because anyone could reach anyone else. In the early days of e-mail, systems were proprietary. That is, large companies had internal email not connected to the outside world. Online services, such as Prodigy and America Online, had email systems that only allowed exchange with other members of that service. Thus, email had not been an application that drove many people online.

Whereas in the early 1990s there were roughly 15 million email accounts worldwide, by the end of 1999 there were 569 million.⁴⁰ In the U.S. there were about 333 million. Accounting for multiple accounts and home/household overlap, an estimated 110 million American were using email, or 52% of Americans more than 14 years old. This compared to about 7% six or seven years earlier. As the Internet's reach accelerated, consumer demand and commercial practicality quickly forced – or encouraged – the various networks to open their systems to sending and receiving email over the Internet, using standard protocols.

Internet Relay Chat – IRC – has undergone similar growth. IRC is the basis of chat rooms, which allow users to engage in real time text (and increasingly voice) conversation. Like email the early chat rooms were service specific, but chat is now available across the Internet, using software that is available for free.

Summary of Forces and Trends

Data presented here or in the research cited in this paper support the following conclusions:

- Compared to other technology innovations, there has been unprecedented rapid adoption of the Internet and email between 1994 and 2000 among all strata of the population .
- Many other similar technology-inspired products achieved near universal adoption without massive government or even private programs: radio, television sets and VCRs among them.

- Prices for computers and similar devices have been falling constantly and substantially, to levels equal to a decent color television set.
- Though services such as telephony and cable have tended to lag behind in adoption rates due to ongoing fees, free Internet access is available using a broadcast TV and radio model in areas that include most of the population.
- Rates of adoption for those groups variously included on the unwired side of the early divide are greater than for the population as a whole.
- Some gaps have already disappeared. For example, from 1994 to 1997 there was high visibility of the gender gap: Initially more than two thirds of Internet users were male. By 2000 that gap all but disappeared, as 50.4% of Internet users were women.⁴¹ It simply reflected that early users came from computer science and engineering discipline that were more heavily male.
- Among those who do have access to computers and the Internet, patterns of use are similar across income, gender and ethnic lines.

From a policy perspective, there are other reasons the digital divide is less a crisis than a temporary and normal process. The following sections address some of the specific subsets of the digital divide concerns

Concerns for Rural Users

Surveys such as those from NTIA and Vanderbilt implicitly link “poor” and “rural” together. For decades telephone service prices were adjusted so that rural dwellers paid roughly the same for service as urban dwellers, despite higher cost in servicing the former.

There remain assumptions that rural dwellers need help with networks because they live in low density, more expensive to wire territories. There are, to be sure, poor rural families. But the subsidies in the past also went to middle class farmers and wealthy ranchers who, when unable to get cable routinely installed \$15,000 satellite dishes. Meanwhile single

working mothers in the cities and mom and pop store owners paid telephone rates that helped subsidize the rural subscribers.

Although most attention has focused on the higher cost of serving rural areas and the “burden” of charging full cost recovery in the pricing to rural users, policy-makers seem to have overlooked factoring in the countervailing economics associated with rural living. These savings, when compared to urban and suburban dwellers, may be ripe for consideration when determining whether continued subsidies for telecommunications are justified and fair.

Phone Service vs. Auto Insurance

It is beyond the scope of this paper to compare fully the cost of living in urban and rural areas. It highlights instead on a single service that is almost as ubiquitous and or similar economic and cultural importance as Internet access: automobile ownership; in particular the cost of automobile insurance. Assuming that there is general agreement that access to an

Table 3
Auto Insurance in Three Communities, 2000

<u>City/Town and ZIP</u>	<u>Lowest Rate*</u>	<u>Low to High Gap</u>
Philadelphia, PA 19122	\$3940	+\$3323
Carlisle, PA 17013	1070	+ 2253
Atchison, KS 66002	617	---

*For identical coverage on 1996 Ford Taurus GL, married male driver, age 50. Used lowest quote if more than one.

Source: <http://www.insuremarket.com>, May 4, 2000.

automobile is at least as important as access to a computer and the Internet, it’s meaningful to realize that there are huge real gaps in costs for auto insurance. Table 3 shows that a resident of a low income neighborhood in Philadelphia might pay nearly four times that of a resident of

the suburban town of Carlisle, Pennsylvania, about 120 miles west of Philadelphia and more than six times as much for auto insurance than a resident in rural Atchison, Kansas.⁴²

It could be rationalized in that the rural residents of Atchison pay less in insurance because there are fewer accidents and auto thefts – that is, the cost of service is lower than in an urban area. The calls into question policy responses for subsidizing Internet access in rural areas because there costs are higher there than in urban areas. Similar gaps may exist in other large ticket and important items, such as the cost of urban housing compared to rural areas. As a percentage of total household budgets, telecommunications, including cable or DBS fees, would under any scenario be substantially less than items such as housing and auto insurance. Similar reasoning would apply to schools in rural versus urban communities. Expanding this type of analysis would seem appropriate for a more realistic context for deliberating the need – or even direction – for future cross subsidiaries across gaps.

The Case of Voluntary Nonusers

In the statistics on nonsubscribers to telephone, cable service, PC ownership or Internet connectivity there has been scant attention paid to voluntary nonusers – those who could afford it but choose not to. A study of Hispanic households found that the second most voiced reason for not owning a computer, nearly 40%, was “Don’t need.” Another 6% had similar reasons -- “Too old” or “Not interested.”⁴³ This is generally consistent with a survey conducted by National Public Radio, the Kaiser Foundation and Harvard’s Kennedy School of Government. Of those characterizing themselves as being “left behind” in computers, barely 20% blamed cost.⁴⁴ A third were just not interested. Mueller and Schement , drawing from interviews with non-telephone subscribers, found households that were willing to pay \$20 or more per month for cable but not \$6 for a dial tone.⁴⁵

Thus, among the fourth of households that did not subscribe to cable or DBS in 2000 it is reasonable that many, if not most, passed on the opportunity by choice. Some elderly are

quite happy watching the existing over-the-air stations and see no need for 85 channel cable options. Other non-subscribers opt out for many possible reasons: distain for programming, fear that their kids will watch too much and so on.

There is both anecdotal evidence and increasing statistical verification that large numbers of individuals are voluntary nonparticipants, for which no manner of programs of financing will change until they see the personal value. Further research is needed to help determine an accurate number of those who *want* PCs and Internet access but who don't have it because of cost. It is likely to be somewhat smaller than the absolute nonuser number.

Wiring Schools and Libraries

The policy of helping schools and libraries with their education and information missions in light of changing technologies is on more solid historical and policy footing than policies directed at individuals and households. Still, there remain caveats that seem to have been given little attention in the digital divide debate.

Foremost among them is the type of aid that should be given schools and the conditions, if any, that should be attached. Currently, the Universal Service Fund tax on telephone bills is providing billions of dollars earmarked for wiring institutions to the Internet and providing related equipment. With the money available, schools are spending sums for construction and hard wiring far in excess of what it might take to install an improving breed of wireless technologies.

A study from the Benton Foundation (2000) raises questions about how these "E-Rate" funds are being used. There is often not a clear sense of what they will do with their wired buildings. In Cleveland, for example, though the Educational Technology Office has programs to train teachers on computers, it is not coordinated with the Curriculum and Instruction Department, which would be responsible for bringing technology uses into the classroom.⁴⁶

And where there is the semblance of a plan, it is often in the absence of a sound pedagogical footing.

Having computers available in the schools is an unassailable necessity, just as is having a school library. That there are differences between the libraries in wealthier school districts and poorer ones has long been a reality as well. However, as seen in Table 4, by 1999 those differences in Internet connectivity were small and narrowing, at least along minority and income lines. Schools with high minority enrollments (50% or greater) had one computer per 6.5 students. This compared to one computer per 5.0 students in schools with under 5% minority enrollment. Results were slightly better when comparing poor students with wealthier ones. In schools where over 50% of students qualified for the federal free lunch program there was one computer per 6.2 students compared to one per 4.9 students in schools with no such students. Thus, a “wealthy” school with 1000 students might have 204 PCs, while the poorest schools of similar size had 161 PCs. That would translate to a potential of about six hours of computer time per student per week available in the wealthiest schools to almost five hours per student in the very poorest.

Table 4 further shows that poorer schools were a minimal 10% lower in Internet access in 1999 with 84% of the schools with the poorest students having access compared to 94% of the wealthiest. As significant, the poorer schools are closing the gap rapidly. Between 1997 and 1999 the poorer schools had a 42% improvement in access, compared to half that rate for the wealthiest schools. Moreover, most if not all these improvements came prior to significant expenditures from the E-rate programs of the Universal Service Fund, indicating they are the result of local budget commitments.

There is also reason to conclude that the poorer schools, having been later to the game, are benefiting from lower costs for equipment and the improved performance of PCs compared

Table 4					
Computers and Internet Access in School Districts Based on Race and Wealth					
	Computers per student:				
Measurement criteria:	None	Under 5%*		Over 50%	
		1998	1999	1998	1999
Minority enrollment		5.3	5.0	7.1	6.5
Qualify for free lunch program	4.9			N.A.	6.2
	% Schools with Internet Access:				
		1997	1999	1997	1999
		6%< poverty level		>29% poverty level	
Poverty level students		78	94%	59	84
* 0-10% for Internet access					
Source: <i>Technology in Education: A comprehensive Report on the State of Technology in the K-12 Market</i> , Market Data Retrieval, 1999. Figures 16, 17, 40					

to those that would have been purchased by the “cutting edge” schools at higher prices a few years earlier.

Public libraries have long been the preferred societal mechanism for leveling the information access field. As with the schools, district to district discrepancies in resources is not a new issue. Acquiring browsing devices, printers, Internet access and subscriptions, online archives and data bases are part of the budgeting process. At some point -- if not now -- all libraries will have to realize that online access reduces the need for periodical subscriptions and many references works that accounted for portions of their budgets. The digital library will have to take away allocations that heretofore went to the analog library.

Furthermore, libraries may take advantage of the virtual world by reducing the need for bricks and mortar. Although it may be decades before fiction and biographies become more practical in digital form over a printed book, the increased availability of reference material online should reduce the need for library expansions. Moreover, once digital, it makes no sense to require patrons to come to the library to use a terminal if the same data can be accessed from home connections. The library card of the future may be in the form of a password that gives holders access to the subscriptions the library has. The savings in real estate could thus become

available for services for those users who do not have home access. Making these sorts of changes in priorities is not easy after centuries of buildings and books.

In many communities the cost of high speed access will be covered by cable systems that have been obligated to provide access to libraries, school and other municipal facilities under the terms of their franchise agreements with their municipalities.

As a policy matter there are or can be mechanisms in place to manage whatever discrepancies remain, primarily at the state level but in federal programs as well. Decisions of how much to spend on hardware, software and training are not new to budgeters. With the declining cost of hardware, increasingly it will be teacher training – and teacher enthusiasm – that can be the focus of the educational policy process as it applies to new learning and teaching approaches.

Policy Issue: Democracy or Entertainment?

Schement characterizes the digital divide debate as a “lively, dynamic and enlightening” process that is one of the joys of democracy.⁴⁷ Politicians in particular are prone to wrap their rhetoric on the digital divide in terms of furthering democracy. And in many respects this is a political issue as much as a social one. Typical is the FCC Chairman William Kennard: “Our society is not represented by a chat among a homogeneous few, but rather a democratic chorus of many different voices and divergent views.”⁴⁸ However, it may be more tenuous to equate access to the Internet or to cable as one on which the Republic depends.

Much of this, is “déjà vu all over again.” Television had raised the expectations of many social theorists for education and the political process. The Kennedy-Nixon presidential debates of 1960 seemed to lend some hope for these expectations. But despite television’s important roles in forming public opinion during the Vietnam War and creating shared experiences during events such as the O.J. Simpson trial in 1996, for most viewers most of the time it is a source of simple entertainment. Ratings for national network news shows, never

high, have been moving steadily down. The all-news cable networks get ratings of 0.5% while special interest networks such as all public service all the time C-SPAN have even lower viewership. Home shopping shows have higher viewership than public affairs. The old commercial broadcast networks, though way down from their pre-cable peaks, still get 15% or so of households each during prime time. The issue for policymakers: Is it a national policy priority to keep basic cable rates low to provide Americans with “Rug Rats” (a popular children’s show in 2000)?

The Internet is similarly a mixed bag. Undoubtedly being connected has its value. But surveys have found that services such as chat rooms (sex is popular), sports, and game playing top the list of activities. It is wonderful having access to news and finance and diverse opinions from providers who would never have a world wide audience pre- Internet. But as research repeatedly confirms, once digitally enabled, all groups – by income, ethnicity, gender and education – fall into almost identical pattern of usage. News and public affairs is way down the list of uses. Connecting those not yet connected will likely result in a continuation of this pattern.

Conclusion

The overwhelming weight of the data, from the NTIA surveys to the Cheskin Research study, all point in a direction that is historically consistent and socially positive. New and expensive technologies have to start somewhere and almost invariably that means with two groups: those who find it undeniably useful – often commercial entities – and those who can simply afford it. Similarly, where infrastructure must be built, the provider will start their build outs aimed at audiences who are most likely to understand the value and be amenable to their service. Again, that typically means a focus on commercial ventures and wealthier residential areas.

The economic advantage of this market-driven self interest is that it creates an invisible cross subsidy for those who follow. The early adopters pay higher per unit costs that reflect

lower production volumes of manufactured products – such as PCs -- or start-up costs of services, such as Internet access via cable system. But as production builds, unit costs decline, product costs decline and manufacturers are able to lower prices. In the case of personal computer devices, that process is compounded by advances in component technologies such as hard disk drives as “box” manufacturers increase their own output.

The builders of networks – traditional and new telephone, wireless, cable and even electric distribution players – similarly know that the marginal cost of adding users to a network is low and thus highly profitable. Once the fixed cost of the network has been made, additional users not only cost them little to add, but network externalities actually make their service of greater value to current and new customers. Thus they have an incentive to lower price and increase utilization.

Does cost create a barrier? The simple answer is, of course. Any cost is a barrier. The real question is it a fatal or unfair barrier given the standard of living (referring here to the United States, but applicable to societies of similar wealth)? It is, perhaps, a huge testimony to the overall prosperity and well being of American society at this point in history that an issue such as the digital divide can marshal the attention and commitments it has.

The data is clear that there are households and institutions that are disadvantaged, in information access as in other arenas. It is endemic to the democratic capitalist system and to any other systems that has been tried. By the same token, programs and policies historically have taken the hardest edge off those gaps. But in the past where goods or services are truly important to people there has been great success in minimizing differences among groups -- (automobiles, radio, television and cable are examples in this context).

Information access *is* important. But where does it sit among the schedule of other phenomena for which there has been little or no concern about gaps and advocates who demand government programs to remove them. Having access to an automobile and to have a

license to operate one was certainly more critical to one's livelihood in the second half of the 20th century as having access to e-mail may be today. And undoubtedly there were gaps between those who could afford an automobile and its ongoing operating expenses and those who could not. Were there studies of income and ethnicity and gender to document the auto have and have not gap? The policy question is not whether some group of citizens has more of something than another. It is abundantly obvious that that is true and will continue to be true.

The forces and trends summarized in this paper suggest that self-evident forces of declining cost, natural acculturation and growing availability are so far taking moving quickly in the direction of widespread adoption. At some point before the end of this decade the declining cost curves and adoption curves will flatten. At that point it will be time to take stock of whether a true divide remains, who is on each side, and then determine what policies can best address the resolution.

Notes

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² "Falling Through The Net: Defining The Digital Divide," National Telecommunications and Information Administration, U.S. Department of Commerce, 1999.

³ Calvin Sims, "Group of 8 Pledges to Help Poor Countries," *The New York Times*, July 24, 2000 at <http://www.nytimes.com/library/world/global/072400g8-meeting.html>.

⁴ Thomas G. Krattenmaker, *Telecommunications Law and Policy*, 2nd ed. (Durham, NC: Carolina Academic Press, 1998), p. 350.

⁵ 47 U.S.C. § 151 (1994).

⁶ Pamela Mendels, "Internet Access Spreads to More Classrooms, Survey Finds," *The New York Times*, December 1, 1999.

⁷ Marc Lacey, "Clinton Enlists Help for Plan to Increase Computer Use," *The new York Times*, February 3, 2000.

⁸ William E. Kennard, "Equality in the Information Age," *Federal Communications Law Journal*. 51:3 May 1999 at <http://www.law.indiana.edu/fclj/pubs/v51/no3/KenMac1.PDF>

⁹ Proposed First Quarter 2000 Universal Service Contribution Factor, CC Docket No. 96-45, Public Notice, DA 99-2780

(http://www.fcc.gov/Bureaus/Common_Carrier/Public_Notices/1999/da992780.doc) and Separate Statement of Commissioner Furchtgott-Roth

(http://www.fcc.gov/Bureaus/Common_Carrier/Public_Notices/1999/d992780a.doc).

¹⁰ Kennard.

¹¹ Falling through the Net: A Survey of the "Have Nots" in Rural and Urban America," National Telecommunications and Information Administration, U.S. Dept of Commerce, July 1995 at <http://www.ntia.doc.gov/ntiahome/fallingthru.html>.

¹² NTIA, "Falling Through the Net, 1999.

¹³ Donna L. Hoffman and Thomas P. Novak, "The Evolution of the Digital Divide: Examining the Relationship of Race to Internet Access and Usage Over Time," May 1999 at <http://www2000.ogsm.vanderbilt.edu/digital.divide.html>.

¹⁴ "School Uses of Computers—Reports from a National Survey," No. 1, April 1983, The Johns Hopkins University Center for Social Organization of Schools, p. 3.

¹⁵ Found at <http://www.ntia.doc.gov/ntiahome/fallingthru.html>.

¹⁶ Hoffman, D.L and T.P. Novak (1999), "The Evolution of the Digital Divide: Examining the Relationship of Race to Internet Access and Usage Over Time," Working Paper (May 1999).

¹⁷ Falling Through The Net: Defining The Digital Divide, (NTIA III) <http://www.ntia.doc.gov/ntiahome/fttn99/part1.html>, Part 1, Section A.

¹⁸ NTIA III 1999, Part I Section B.

¹⁹ Milton Mueller and Jorge R. Schement. "Universal Service from the Bottom Up: A Profile of Telecommunications Access in Camden, New Jersey." *The Information Society* 12, 3 (1996) 273-291.

²⁰ Benjamin Compaine and Mitchell Weinraub, "Universal Access to Online Services: an Examination of the Issue," *Telecommunications Policy* Vol 21 No. 1, 1997, pp. 15-33.

²¹ Benjamin M. Compaine, "The New Literacy: or How I Stopped Worrying and Learned to Love Pac-Man," in Benjamin M. Compaine, ed., *Understanding New Media* (Cambridge, Mass: Ballinger Publishing Co., 1984); Benjamin M. Compaine, "Information Technology and Cultural Change," in Benjamin M. Compaine, ed. *Issues in New Information Technology* (Norwood, NJ: Ablex Publishing Corporation, 1988). Sherry Turkle, *Life on the Screen: Identity in the Age of the Internet* (New York, Touchstone Books, 1997).

²² Even the programming that is apparently “free” has some cost in the form of marketing costs that are part of the prices we pay for goods and services that advertise. How much that cost really is and how much different prices would be if there were no advertising (and hence less competition and thus hypothetically perhaps *higher* prices for many goods and services) is left to another venue.

²³ *Statistical Abstract of the United States, 1999*, p. 580, Table 920. Source of the table is *The Veronis, Suhler & Associates Communications Industry Report*, annual.

²⁴ *Ibid.*, p. 581, Table 921.

²⁵ *Ibid.*

²⁶ Calculated by adding books, newspapers and magazines, video, audio and computer products, radio and TV repair and motion picture theater admission by personal consumption expenditures. From U.S. Bureau of Economic Analysis data in *The U.S. Statistical Abstract*, 1985 and 1998.

²⁷ John Markoff, “Microsoft Deal to Aid Blending of PCs and TVs,” *The New York Times Interactive*, April 7, 1997, at <http://www.nytimes.com/library/cyber/week/040797webtv.html>.

²⁸ At <http://www.netpliance.com>, August 10, 2000

²⁹ As the story goes, in 1965 Gordon Moore, a founder of Intel, which has developed most of the central processing units (CPUs) used in personal computers, was preparing a speech. When he started to graph data about the growth in chip performance, he realized there was a striking trend: Each new chip contained roughly twice as much capacity as its predecessor, and each chip was released within 18 to 24 months of the previous chip. If this trend continued, he reasoned, computing power would rise exponentially over relatively brief periods of time.

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³⁴ Author’s personal experience, from receipts.

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- ³⁸ *Ibid.*, p. 204, Table 12.1.
- ³⁹ Bluelight.com Web site, <http://www.bluelight.com/freeinternet/>, accessed August 10, 2000.
- ⁴⁰ “Year End 1999 Mailbox Report,” Messaging Online, <http://www.messagingonline.com/> accessed May 5, 2000.
- ⁴¹ Laurie J. Flynn, “Internet Is More Than Just Fun for Women,” The New York Times, August 14, 2000, accessed at <http://www.nytimes.com/library/tech/00/08/biztech/articles/14gend.html>. The article cites a study by Jupiter Communications based on a survey of 55,000 households.
- ⁴² Personal observation also suggests that gasoline is considerably less expensive in Northeastern Kansas than in Philadelphia.
- ⁴³ “The Digital World of the US Hispanic,” Cheskin Research, April 2000, p. 5.
- ⁴⁴ “National Survey of American Adults on Technology,” National Public Radio/Kaiser Family Foundation/Kennedy School of Government, at <http://www.kff.org/content/2000/20000228a/TechnologyToplines.PDF>, accessed August 10, 2000, p. 3.
- ⁴⁵ Mueller and Schement, “Universal Service....”
- ⁴⁶ Andy Carvin, ed., “The E-Rate in America: A Tale of Four Cities,” Benton Foundation, February 2000, p.22
- ⁴⁷ Jorge Reina Schement, “Of Gaps by Which Democracy We Measure,” *Information Impacts Magazine*, Dec. 1999 at www.cisp.org/imp/december_99/1299schement.html.
- ⁴⁸ William E. Kennard, “Equality in the Information Age,” *Federal Communications Law Journal* 51:3, May 1999, p. 556.