policy works. In the 1960s, it was widely believed that central banks could attempt to hasten or dampen growth in the economy by lowering or raising the interest rate. This view fell into disfavor with the inflation of the 1970s. Economists, and central bankers, increasingly came to believe that central banks should instead adhere to rules or targets, such as a fixed rate of money supply growth or a targeted rate of inflation. As is clear from the minutes and transcripts of open market committee meetings, the Greenspan Fed was quite explicitly engaged in fine-tuning. It raised and lowered interest rates on the basis of its perception of the economy's current momentum. To a large extent, it appeared that its tweaking of the economy worked: the Fed was largely successful in its efforts to control the rate of economic growth over this period. At the very least, economists may acknowledge that monetary policy is more effective than most had previously believed. The recognition of the importance of this tool can have a substantial impact on the conduct of macroeconomic policy in the future.

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Chapter 35

The Digital Divide and What To Do about It

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In a society where knowledge-intensive activities are an increasingly important component of the economy, the distribution of knowledge across the population is increasingly linked to stratification. Much attention both among academic researchers and in policy circles has been paid to which segments of the population have access to the Internet or are Internet users. Although the medium has seen high rates of diffusion, its spread has been unequal both within and across nations. In this chapter, we will look at (1) individual-level inequality in Internet access and use in the United States, (2) cross-national variation in connectedness, and (3) inequality from the side of content producers in gaining audiences for their material on-line. © 2003, Elsevier Science (USA).

New Economy Handbook

Autonomy of use The freedom to use technologies when, where, and how one wishes.

Digital divide The gap between those who have access to digital technologies and those who do not, or the gap between those who use digital technologies and those who do not, understood in binary terms distinguishing the "haves" from the "have nots."

Digital inequality A refined understanding of the "digital divide" that emphasizes a spectrum of inequality across segments of the population depending on differences along several dimensions of technology access and use.

On-line skill The ability to use the Internet effectively and efficiently.

Portal A web site that primarily presents itself as a one-stop, point-of-entry site to the content of the Web.

Universal service Policy to ensure that everyone has affordable access to the telecommunications network.

I. INTRODUCTION

In a society where knowledge-intensive activities are an increasingly important component of the economy, the distribution of knowledge across the population is increasingly linked to stratification. The mass diffusion of the Internet across the population has led many to speculate about the potential effects of the new medium on society at large. Enthusiasts have heralded the potential benefits of the technology, suggesting that it will reduce inequality by lowering the barriers to information and allowing people of all backgrounds to improve their human capital, expand their social networks, search for and find jobs, have better access to health information, and otherwise improve their opportunities and enhance their life chances. In contrast, others caution that the differential spread of the Internet across the population will lead to increasing inequalities, improving the prospects of those who are already in privileged positions while denying opportunities for advancement to the underprivileged.

Much attention both among academic researchers and in policy circles has been paid to which segments of the population have access to the Internet or are Internet users. Access is usually defined as having a network-connected machine in one's home or workplace. Use more specifically refers to people's actual use of the medium beyond merely having access to it. The "digital divide" is most often conceptualized in binary terms: someone either has access to the medium or does not, or someone either uses the Internet or does not. In this chapter, we will offer a refined understanding of the "digital divide" to include a discussion of different dimensions of the divide focusing on such details as quality of equipment, autonomy of use, the presence of social support networks, experience, and on-line skill. In addition to discussing inequalities at the national level, we will also look at the unequal diffusion of the Internet across countries. Furthermore, we will consider the divide that exists at the level of content production and distribution. Finally, we will discuss what type of policy approach may help in avoiding possible new inequalities emerging from differential access to and use of the Internet.

II. DEFINING THE "DIGITAL DIVIDE"

Although the Internet has been around for several decades, it saw wide diffusion only in the second part of the 1990s. Its growth has been especially large since the emergence of graphical browser software for the Web in 1993. The number of Americans on-line grew from 25 million in 1995, when only 3% of Americans had ever used the Internet, to 83 million in 1999, with 55 million Americans going on-line on a typical day in mid-2000. In 1994, just 11% of U.S. households had on-line access. By the end of 1998, this figure had grown to 26.2%. Less than 2 years later it stood at 41.5%, and well over 50% of individuals between the ages of 9 and 49 reported going on-line at home, work, or some other location. By 2001, over half of the American population was using the Internet on a regular basis (see Fig. 1 for basic Internet user statistics in the United States over time).

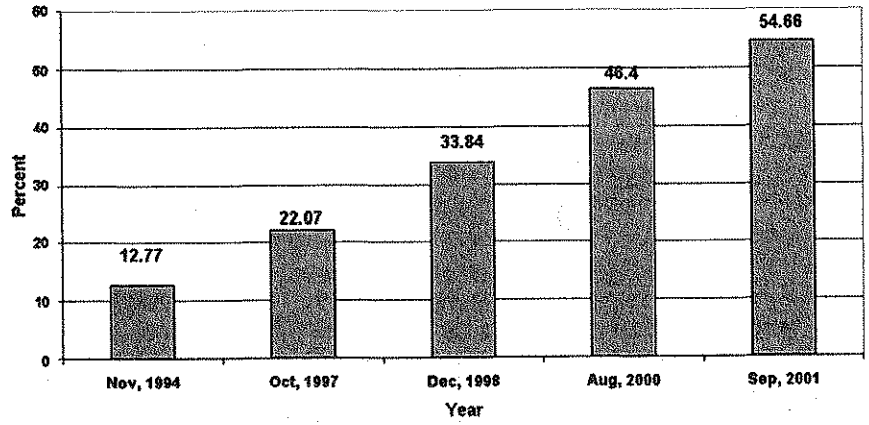

Figure 1 The percentage of the adult U.S. population on-line, 1994–2001. Data source: Current Population Survey.

With the rise of the Internet's importance in all spheres of life, there has been increasing concern regarding the patterns of its diffusion across the population. Reports have documented the clear presence of an Internet "digital divide," i.e., inequalities in access to and use of the medium, with lower levels of connectivity among women, racial and ethnic minorities, people with lower incomes, rural residents, and less educated people. (See Figs. 2–7 for information about the percentage of various population groups on-line.)

Whereas most reports identify differences among various segments of the population, over time studies emphasize the increasing diffusion of the medium among the population at large. There is considerable disagreement about whether inequalities in access and use are increasing or decreasing across different demographic categories. Some argue that with time the majority of the population will be on-line and that no policy intervention is necessary to achieve equal distribution of the medium across the population (Compaine, 2001). Others emphasize the increasing differences among various segments of the population at large (Dickard, 2002).

These approaches are in stark contrast despite the fact that most of these reports often rely on the same source of data: the Computer and Internet Use Supplement of the Current Population Survey administered by the U.S. Census Bureau and the Bureau of Labor Statistics. The positions differ because there are different ways in which one can interpret the data. Let us consider, for example, the Internet use statistics for Hispanics and non-

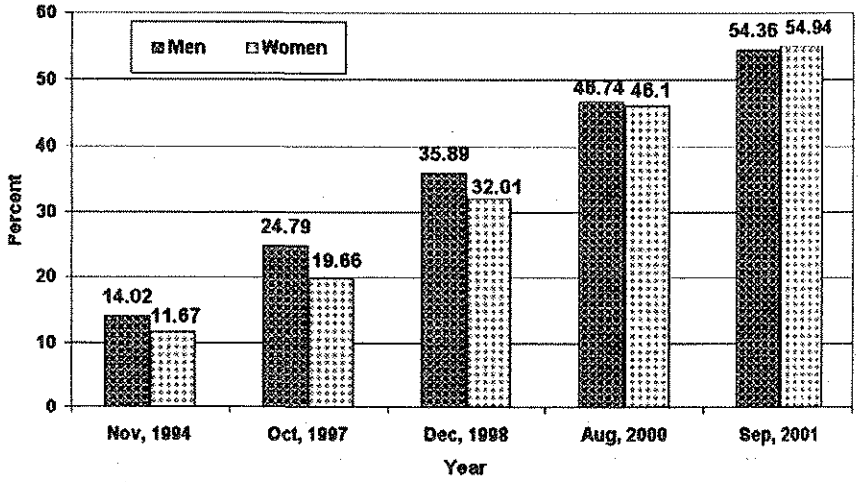

Figure 2 The percentage of men and women on-line among the adult U.S. population, 1994–2001. Data source: Current Population Survey.

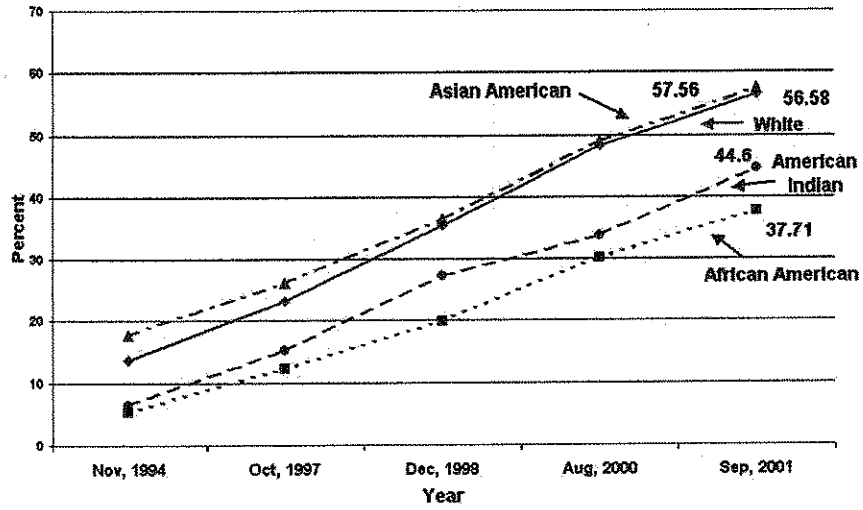

Figure 3 The percentage of racial groups on-line among the adult U.S. population, 1994–2001.

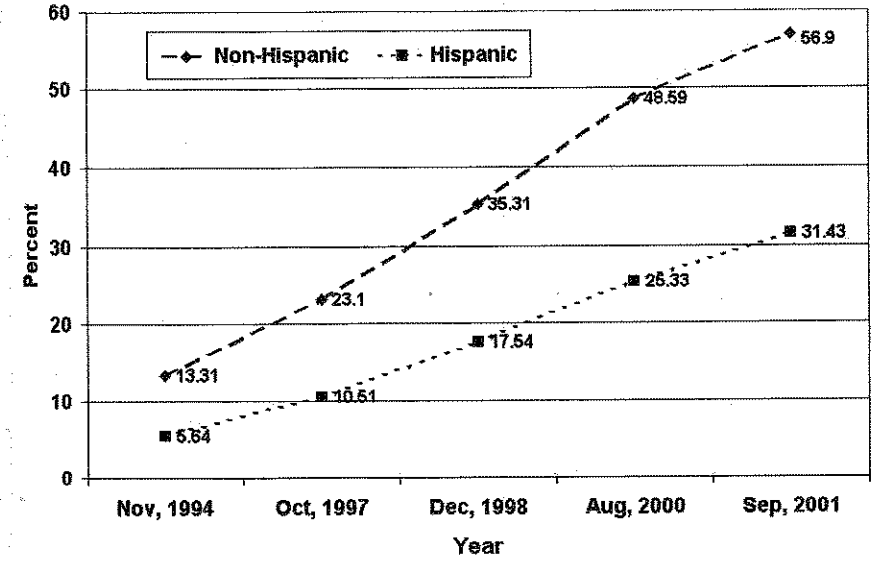

Figure 4 The percentage of non-Hispanic and Hispanic groups on-line among the adult U.S. population, 1994–2001.

Hispanics (see Fig. 4). It is certainly the case that use has dramatically increased in both segments of the population: the percentage of Hispanics on-line has grown from 5.6% in 1994 to 31.4% in 2001, whereas the percentage of non-Hispanics on-line increased from 13.3 to 56.9%. From this perspective, Internet use is clearly on the rise in both groups. Moreover, whereas the percentage of non-Hispanics on-line increased by just over four times, the growth among Hispanics was over fivefold. Such interpretation suggests optimism at curbing inequality between groups. However, if we look at Fig. 4, we see that the gap between the two lines has increased from 7.7 percentage points in 1994 to 24.5 percentage points by 2001, suggesting that the overall difference in the percentage of users is increasing, potentially leading to more inequality among these two segments of the population. How we interpret the figures has much to do with what type of divide—if any—we see. Comparison of penetration rates across population groups is more informative than considering numbers about any one population segment in isolation. Comparison across groups suggests that certain divides persist and in some cases are growing with respect to Internet diffusion.

III. FROM DIGITAL DIVIDE TO DIGITAL INEQUALITY

Figures 2–7 show that Internet use is spreading at varying rates across different segments of the population. Some have cautioned that the differential spread of the Internet will lead to increasing inequalities, benefiting those who are already in advantageous positions and denying access to better resources to the underprivileged. Robert Merton (1973) called this the "Matthew effect," according to which "unto every one who hath shall be given," whereby initial advantages translate into increasing returns over time.

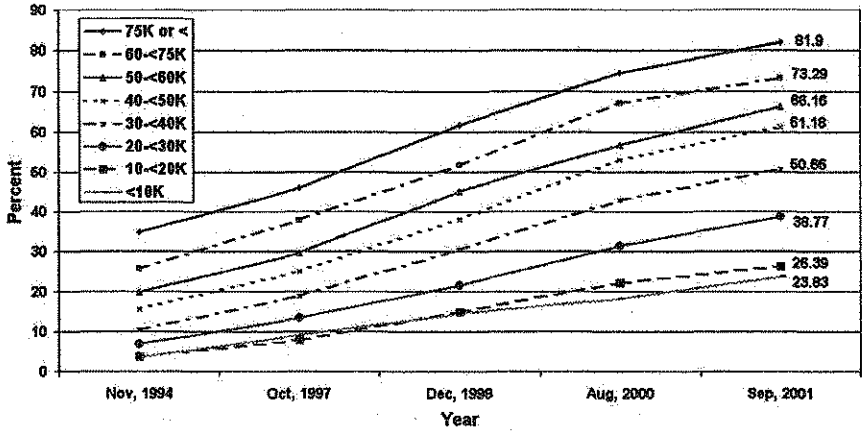

Figure 5 The percentage of groups with different incomes on-line among the adult U.S. population, 1994–2001.

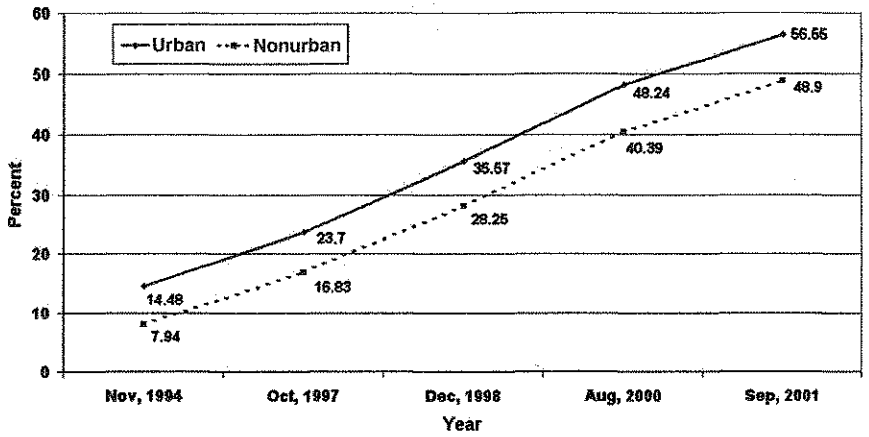

Figure 6 The percentage of urban and nonurban groups on-line among the adult U.S. population, 1994–2001.

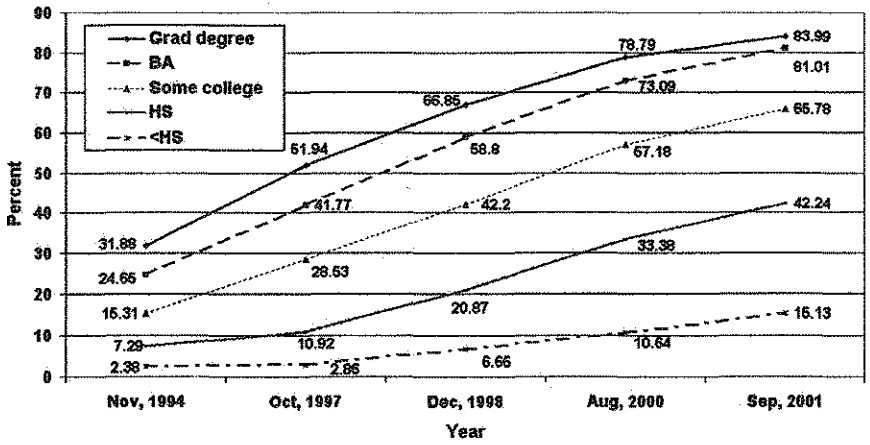

Figure 7 The percentage of groups with different educational attainment on-line among the adult U.S. population, 1994–2001.

Research on information technologies has found support for this latter expectation. Mass media seem to reinforce knowledge gaps across the population. Past studies have found evidence for this in the realm of general foreign affairs information (Robinson, 1967), political knowledge and participation (Eveland and Scheufele, 2000), diffusion of daily TV news information (Robinson and Levy, 1986), and a broad range of other information contexts (Gaziano, 1983). With respect to the Web, the Matthew effect predicts that those having more experience with technologies and more exposure to various communication media will benefit more from the Web by using it in a more sophisticated manner and for more types of information retrieval. Evidence has already been presented regarding the connection between the use of traditional news and entertainment media and computers and the Internet (Robinson *et al.*, 1997, 1998). Such findings suggest that use of the Internet leads to greater information gaps.

As more people start using the Web for communication and information retrieval, it becomes less useful to merely look at binary classifications of who is on-line when discussing questions of inequality in relation to the Internet. Rather, we need to start looking at differences in how those who are on-line access and use the medium. Such a refined understanding of the "digital divide" implies the need for a more comprehensive term for understanding inequalities in the digital age; DiMaggio and Hargittai (2001) suggest that the term "digital inequality" better encompasses the various dimensions along which differences will exist even after access to the medium is nearly universal.

Some scholars have suggested ways in which we need to distinguish between different types of Internet use. One such approach (Norris, 2001) suggests distinguishing between divides at three levels: (1) the global divide, which encompasses differences among industrialized and lesser developed nations; (2) the social divide, which points to inequalities among the population within one nation; and (3) a democratic divide, which refers to the differences among those who do and do not use digital technologies to engage and participate in public life. Wilson (2000) took this classification a step further by identifying four components of full social access: (1) financial access, which indicates whether users (individuals or whole communities) can afford connectivity; (2) cognitive access, which considers whether people are trained to use the medium and to find and evaluate the type of information for which they are looking; (3) production of content access, which looks at whether there is enough material available that suits users' needs; and (4) political access, which takes into account whether users have access to the institutions that regulate the technologies they are using. Warschauer (2002) has also offered an alternative approach suggesting that, in addition to the physical sides of access, other factors such as content, language, literacy, education, and institutional structures must also be taken into consideration when assessing the level of information and communication technology use in a community. These researchers all call for a more holistic approach to the study of digital inequality.

As the preceding refined approaches illustrate, there are factors beyond mere connectivity that need to be considered when discussing the potential implications of the Internet for inequality. In addition to relying on basic measures of access to a medium, we need to consider the following more nuanced measures of use:

1. technical means (quality of the equipment)
2. autonomy of use (location of access, freedom to use the medium for one's preferred activities)
3. social support networks (availability of others to whom one can turn for assistance with use, size of networks to encourage use)
4. experience (number of years using the technology, types of use patterns)

These four factors together contribute to one's level of *skill. Skill is defined as the ability to use the new technology efficiently and effectively.* Here, we will consider these five components, which should guide our analyses of digital inequality at the individual user level.

A. Technical Means

For Internet use, several dimensions of equipment quality are relevant to questions of equal access. People who have access to top-quality computers with good and reliable Internet connections at home or at work are much more likely to exhibit high levels of sophistication than those without access to such technical resources. Better hardware, better software, and a faster connection are the infrastructural basis of having access to all that the Web has to offer. When using outdated equipment, more time may be necessary to reach on-line resources, resulting in fewer opportunities for users to acquaint themselves with and explore varied corners of the Web. Users may become frustrated by long download times and the inability to access certain sites, potentially leading to less enthusiasm toward the medium and less time spent exploring its features.

B. Autonomy of Use

Although theoretically many Americans have access to the Internet at a public library, access remains easiest for those who are connected through

home or work computers. There are differences in how easily people can reach libraries quickly (e.g., do they live close enough not to require substantial time and monetary commitments to go there), and whether they are free at times when these resources are available (e.g., do their work or family responsibilities make it difficult to capitalize on such resources). Regarding on-the-job access, those with restrictions on their work computer use will not have the freedom to enhance their on-line skills due to the limitations placed on them by their employment environments. These differences in autonomy of use are likely to influence people's level of Web use sophistication. Those who have easier access to resources and more freedom to use them are likely to extract more from the medium.

C. Social Support Network

The literature on the diffusion of innovations emphasizes the importance of social support networks in the spread of new technologies. Those with exposure to innovations in their surroundings are more likely to adopt new technologies such as personal computers. The availability of friends and family who are also Internet users provides support for problems encountered while using the medium and is also a source of new knowledge via advice and recommendations. It is also a source of encouragement to go on-line, as there are more people with whom to communicate and share.

For on-line skills in particular, this implies that people who are able to draw on their social contacts for information on how to use the medium will learn more quickly and will be exposed to a broader repertoire of on-line services than those who have few people to whom they can turn for advice on their Web use. A study of home computer diffusion found that people were more likely to give up using the technology when they had no neighbors or friends to call on for support (Murdock *et al.*, 1992). By contrast, people whose social circles include users knowledgeable about the Web can draw on their networks for site recommendations and suggestions when they run into problems.

D. Experience

Experience is a relevant dimension to consider because it tells us whether people are investing sufficient time in a technology to become familiar enough with it for convenient and efficient use. The amount of prior experience people have with the Internet is likely to affect their on-line actions. People who require the use of a computer and on-line resources for their job or school will have invested time in acquiring higher level skills in this activity, as the acquired knowledge is necessary to perform their work. People who spend more time on-line—whether at work or any other location—will likely acquire more knowledge about the Web and thus will have better on-line skills. Finally, people who have been Internet users for longer are expected to be better at finding information on-line as they have more experiences to draw on. Moreover, these are people who were early adopters and thus tend to be more innovative, suggesting more willingness to explore the new medium and familiarize themselves with it.

E. Skill

A look at the evolution of how literacy has been defined and refined over time is a helpful comparison to show that the focus on and necessity of basic access to a medium is gradually replaced by a more refined understanding of what it means to have efficient access to a communication medium (Kaestle, 1991). Whereas initially literacy simply meant the ability to sign one's name, someone possessing solely those writing skills today would not be deemed literate. Such baseline writing skills today cannot be equated with efficient access to information whether in the form of government documents or job application forms. Similarly, when considering the potential implications of the Internet for social inequality, we cannot rely on a binary classification of who is a user and who is not. Rather, we must also focus on people's ability to use the technology effectively and efficiently.

But how is it possible that skill is a relevant factor when it comes to Internet use given that material posted on-line—all billions of pages worth—is equally available to all users via the correct Web address? Beyond the hurdle of gaining access to a network-connected machine, the zeros and ones that transfer the multitude of information on the network to the user do not discriminate among people. [It is important to note here that the plans for the next generation Internet protocol (IPv6) would allow routers to discriminate among packets, which would lead to increasing inequalities especially with respect to issues discussed in Section V.] Once the correct Web address is entered, the data are accessed and the information is readily available. But how does a user find the particular Web site?

Consider the following scenario. A user is looking for information about political candidates, in particular, she is interested in comparing the views

of two presidential candidates about a controversial issue, say, abortion. There are thousands of Web sites that describe, critique, and compare political actors. However, a simple search on the candidate's name or the word abortion will not yield any obvious results; rather, it will present the user with hundreds if not thousands of possible links to pages with only one of the two topics.

In this particular case, a user who understands how search queries can be refined through the use of quotation marks (to signal proximity of terms), the use of Boolean operators (to suggest whether terms should all be included in a search or whether some terms should be explicitly excluded), and the use of multiple terms in a query will likely turn up helpful results almost regardless of the search engine used. A knowledgeable user may type the following into a search box, *bush gore abortion*, and quickly find relevant results. Nonetheless, even the use of such refined search queries requires additional know-how on the part of the user. Many sites come cluttered with images and text—often in an attempt to make a commercial venture viable—and it sometimes becomes quite challenging to find specific information on a page. Among the 100 participants in a study that surveyed a random sample of Internet users' on-line skills (Hargittai, 2003), only one ever used the "find" function (available in all browsers and on all platforms) to search for a term on a Web page. In the case of this task, looking for the word "abortion" through use of the "find" function would have aided many participants. This action can significantly reduce the effort it takes to find specific content on a page, yet almost no one uses it. The findings from this study suggest that users differ significantly in their on-line skills.

As the preceding examples illustrate, in addition to demographic characteristics, the five dimensions of user attributes—technical means, autonomy of use, social support networks, experience, and skill—are all important for understanding exactly how technologies are being adopted by users and to what extent their uses are similar across different segments of society. Had such nuanced information been collected on other communication media in their early years, we would have a much better understanding of their true diffusion across the population and how they may have contributed to new social inequalities. The preceding dimensions of user attributes must all be considered in our discussions of digital inequality, but they are only starting to become part of researchers' agendas in the field. (For a discussion of information technology skills and the labor market, see Chapter 24 in this volume. To learn more about how use of the Internet differs among segments of the population for job searches, see Chapter 22 in this volume.)

IV. GLOBAL DIGITAL INEQUALITY

Similarly to rapid Internet diffusion within the United States, the number of users has also grown drastically worldwide from approximately 20 million users in 1995 to 520 million in 2001 (see Fig. 8 for details). Although at first glance the figure suggests that Internet access is becoming a reality for vast segments of the global population, it is important to note that even in 2001 less than 10% of the world's inhabitants had ever used the Internet. Moreover, the medium is diffusing at considerably different rates across countries. Figure 9 shows that disproportionate numbers of users are from the North American and European continents, whereas other world regions are vastly underrepresented. Most work on international Internet diffusion has tried to uncover the reasons for such differential rates in spread.

Most initial reports focused on bivariate analyses showing a high correlation between economic indicators and diffusion rates. Education has also been considered an important predictor of Internet use cross-nationally. Some more refined studies have also considered the effects of institutional factors. Hargittai (1999) found that among OECD countries, in addition to national wealth, competition in the telecommunications sector was an important predictor of connectivity. Along similar lines, Kiiski and Pohjola (2002) found that access price was an important determinant of connectivity in OECD countries, a factor likely influenced by the telecommunications policy variable. Guillen and Suarez (2002) also found similar effects of regulatory environment when looking at diffusion rates across over 100

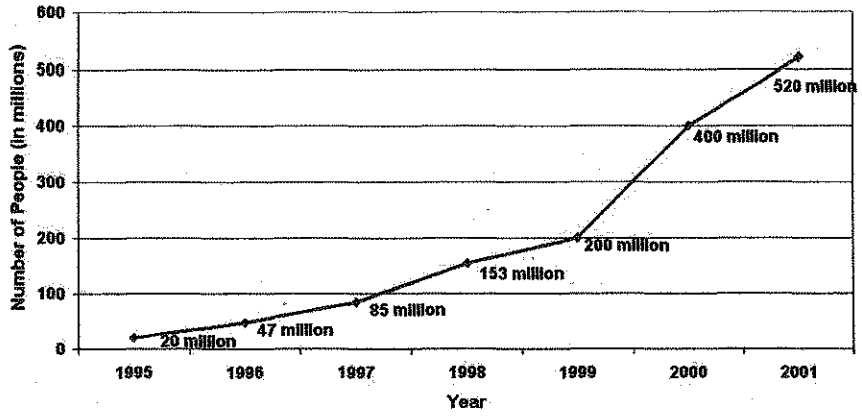

Figure 8 The number of Internet users worldwide, 1995–2001. Data source: Nua Internet Surveys.

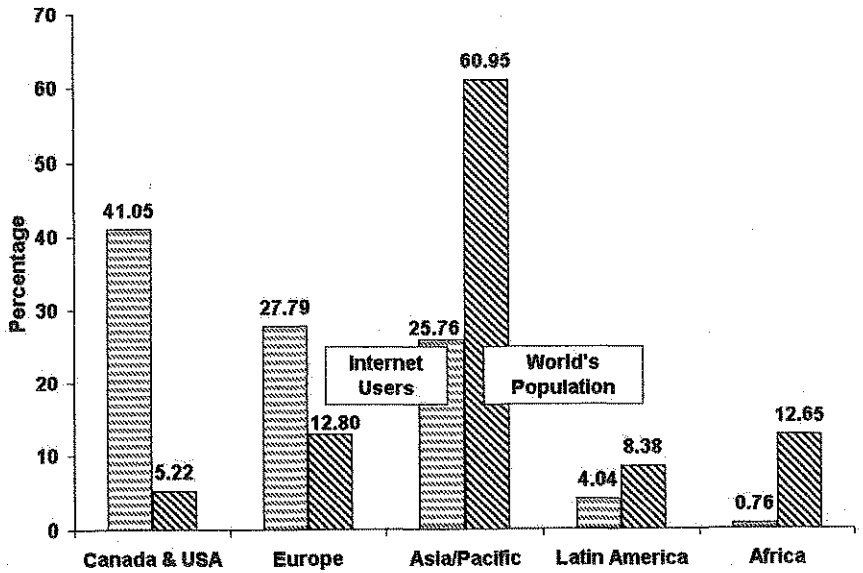

Figure 9 The proportion of Internet users from different geographic regions as compared to the proportion of world population in these regions, 2001. Data source: Nua Internet Surveys.

nations. Research on the diffusion of mobile telephony has also found that competition has a positive effect on the spread of the technology (Gruber and Verboven, 2001; Koski and Kretschmer, 2002).

Although in its initial years of mass diffusion the Internet was widely heralded as a potential equalizing tool across nations, the largely unequal patterns of its diffusion globally suggest that it may end up contributing more to rising inequalities rather than leveling the playing field across nations. (See Chapter 4 in this volume for more on global diffusion patterns.)

V. INEQUALITY IN ACCESS TO CONTENT PRODUCTION AND DISTRIBUTION

In addition to looking at individual level variables to determine how new media are adopted by users, we must also consider institutional factors that shape new technologies. The rapid increase in the number of Internet users was complemented by exponential growth in the amount of information available on the Web. In 1995, there were fewer than 20,000 Web sites. That number grew to over 40 million by 2003, representing billions of Web pages with as many as 2 million pages added daily.

A large portion of these billions of Web pages is available on the Web for public use. Any individual or organization with the know-how to create a site can contribute content to the public Web. The technicalities of making such content as available to users as the most popular Web sites are more or less the same. However, information abundance still leaves the problem of attention scarcity. Attention scarcity leads individual creators of content to rely on on-line gatekeepers to channel their material toward users and leads users to rely on such services to find their way to content on the Web. Web services that categorize on-line information can be considered gatekeepers on the World Wide Web.

The term gatekeeper refers to points that function as gates blocking the flow of some material while allowing other information to pass through. Although there may be numerous high-quality sites on the Web, there is no guarantee that anyone will find their way to them. The central concern is no longer what is produced, but what consumers hear and know about. Accordingly, gatekeeping activity still occurs, but it now takes place at the level of information exposure. Its location has shifted from the decision about what should be produced to the control of what materials get to consumers and of what they become aware. Users with more advanced Web use skills will be less dependent on such gatekeepers and can sidestep them more easily to find information of interest to them.

In order to understand the implications of gatekeeping for the reachability of on-line content—whether commercial or nonprofit content, individual or governmental materials—it is important to distinguish between content that is merely present on the Web in contrast to content to which users are readily exposed. To make this distinction, we will use the word "available" to refer to material that exists on-line and "accessible" to denote content that is easily within the reach of Web users. Whereas availability means mere existence, accessibility implies relative ease of reachability.

As the amount of Web content grew exponentially, search engines became increasingly important in sifting through on-line material. According to one survey, 85% of users have used a search engine (Pew, 2002). Although seemingly neutral, search engines systematically exclude certain sites in favor of others either by design or by accident. Search engines index no more than a small portion of all Web pages, and even collectively the largest engines only account for combined coverage of just a fraction of all information on-line. This suggests that there is great discrepancy between what is physically available on the Web and what is realistically accessible to users.

Undoubtedly, the entry of the private sector into the Internet world encouraged its wide spread and the growth in on-line content. Search engines and portal sites assist millions of users every day in finding information on-line. So why is it a problem that commercial interests sometimes guide the content selection on popular sites? The concern is that search engines that are guided by profit motives may point people away from the most relevant and best quality sites in favor of those that have paid the highest bids for placement on the results page, regardless of their quality or specific relevance to the search query.

Analyses of large-scale search engine usage data suggest that users mainly rely on the first page of results to a search query. A study analyzing almost 1 billion queries on the AltaVista search engine showed that, in 85% of the cases, users only viewed the first screen of results (Silverstein *et al.*, 1999). Web users' habits have not changed much over the years. Another study (Spink *et al.*, 2002) compared data on the use of the Excite search engine from 1997, 1999, and 2001 and found that the mean number of results pages users looked at had decreased over time. The data in this study also showed that the majority of users rely on simple queries without the use of advanced search features mentioned earlier.

These findings suggest that users heavily rely on sites for presenting them with information rather than using sophisticated search strategies to fine-tune their queries. This implies that information prominently displayed on portal sites—whether selected because of high content value or for commercial reasons—has a good chance of being the destination of visitors. If users do not possess advanced know-how about how content is organized and presented to them on-line, then they are especially at the mercy of what content sites decide to feature prominently and make easily accessible to them.

Sites spend significant resources on optimizing their content to show up as results. In fact, an entire industry has sprung up around "search engine optimization," offering advice on how companies and others can best assure that their Web sites climb to the top of search engine results. In contrast, the sites with the most relevant content may be posted by a nonprofit organization or by an individual on his or her own initiative and only appear far down the results list because the owners of such sites do not have the resources to optimize for search engine positioning. So the overall concern due to the prominence of commercial interests on the Web is not that users will unknowingly be roped into purchasing information they could otherwise obtain for free, although this may happen as well, but that they may not find what they are looking for or may miss the best available information because those resources are crowded out by the profit-seeking ventures. Accordingly, inequality exists at the level of content production and distribution in the digital world.

VI. CONCLUSION

The prevailing approach to the "digital divide" focuses on a binary classification of Internet use, merely distinguishing those who are connected from those who do not have access to the medium. Related policy discussions also limit their focus to targeting connectedness without expanding the issue to questions of skill, which can only be achieved by also paying serious attention to training. The binary classification is due to historical precedent. U.S. telecommunications policy for years has been concerned with "universal service," whereby all citizens should have access to affordable telephone service (Schement, 1996).

Following this approach, discussions about Internet use have focused on access only at the expense of considering details about use. In the case of the telephone, it makes sense to target only access as there are only a limited number of ways in which one may use that medium. In contrast, effective access to the Internet means much more than simply having a network-connected machine. Rather, it includes the ability to use the medium effectively and efficiently enabling users to benefit from the medium. These necessary on-line skills can only be achieved universally by focusing policy not only on improving access but also on investing in training. For example, Bolt and Crawford (2000) found that, although there has been a rapid increase in the number of public schools offering Internet access, support for the necessary training and staffing has lagged behind.

Instead of drawing parallels to policy debates about telephone access when considering Internet access policy, a better analogy is to reflect on the varied dimensions of literacy. We do not think about literacy in binary terms. Children are not simply given a book in the first grade and expected to read, nor are they given excerpts from Shakespeare on their first day of class. Instead, we invest in teaching students how to read gradually. The history of literacy shows that our understanding of functional literacy has evolved considerably over time, requiring flexibility in education policy to keep up with the changing landscape. Similarly, it is too simplistic to assume that merely providing an Internet connection to people will obliterate all potential access differences among users. Rather, a more refined approach to the "digital divide" and a more comprehensive understanding of digital inequality are necessary if we are to avoid increasing inequalities among different segments of the population due to disparities in effective access to all that the Internet has to offer.

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