The Benefits of and Barriers to Computer Use for Individuals Who Are Visually Impaired

Elaine Gerber

Abstract: This article presents data from four focus groups of assistive technology (AT) computer users to understand how individuals who are blind or visually impaired gather information about AT and the kinds of information needs that they may have. Qualitative findings are reported on what the focus group participants considered to be the benefits of and barriers to computer use. This article further underscores the importance of accessibility and usability as being helpful concepts for exploring the role of technology in people's lives.

> Cyberspace seems a distillation of America. Both are quick, shallow, and lonely as well as hopeful, energetic, and sociable. (Ayers, 2000, pp. 11–12)

Current estimates predict that individuals with visual impairments (that is, those who are blind or have low vision) are much less likely to use computers than are sighted individuals. The U.S. Bureau of the Census's Survey of Income and Program Participation (SIPP, 1999) indicated that 21% of all noninstitutionalized individuals aged 15 and older with "functional limitations in seeing" have access to the Internet; only 13% of the same population reported using a computer on a regular basis (Gerber & Kirchner, 2001b; National Telecommunications and Information Administration, NTIA, 2000). The rates among the nondisabled population are 57% and 51%, respectively. Although this discrepancy in the use of computers is staggering, these data are insufficient to explain how and when these technologies are used and in what ways they make a difference in people's lives.

The goal of the research presented here was to begin to gather the experience of computer users who are visually impaired. Because computers and assistive technology (AT) are frequently cited as the means to overcome the lack of access to information and other environmental barriers for nonprint readers, the research department at the American Foundation for the Blind (AFB) was interested in how individuals who are visually impaired gather information about AT and the kinds of information needs that they may have. This article reports qualitative findings from a sample of individuals with visual impairments on what they considered to be the "benefits" to computer use (i.e., how computers were helpful to their lives) as well as what they considered "frustrating" (which aspects presented barriers to becoming complete technology and computer users).

The information came from four focus groups and stresses the importance of digital access to individuals' lives and the depth of their fear of being shut out from an increasingly digital world. It further under-

scores the importance of accessibility and usability as helpful concepts for exploring and understanding the role of technology in people's lives. The purpose of this article is to present a clearer, more nuanced understanding of the benefits of and barriers to achieving equal access to computers and other AT to increase the effectiveness of targeted programmatic efforts.

Scope of the problem

The 2002 NTIA survey on computer use and the Internet, which compared the rates at which people with particular disabilities and those without disabilities used computers and the Internet, can shed some light on the behavior of computer users who are visually impaired. Although NTIA's sample was large enough to include an estimate for visually impaired individuals, the number it reported does not necessarily represent the situation for most people with visual impairments in the United States, since, unlike the previous survey (NTIA, 2000), the 2002 survey included only people with disabilities who were in the labor force (that is, those who were either employed or were actively looking for work); people who were not working because of a "disability" were not included. For the population of working-age adults (25–60 year olds in 2001), the survey indicated that visually impaired people used computers *more often* than did nondisabled, sighted individuals for the following tasks: playing games; searching for information on products or services; making online purchases; and gathering information on news, weather, and sports. It also indicated that people who were visually impaired used computers at nearly the same rate as did sighted people for e-mail and for obtaining information on health issues and at a slightly lower rate for finding governmental information.

While the 2002 NTIA survey is by far the most comprehensive federal attempt to map the changing demographics associated with computer use, little is known about the contexts in which all individuals with visual impairments use computers and other AT, what barriers they have to using them, and what benefits they derive from their use.

A growing body of data is also being compiled on which accessibility features for computer hardware and software and for the Internet, from a technological standpoint (e.g., the presence of alt-tags, or hidden navigation bars) are necessary for visually impaired people to use computers and the Internet (see World Wide Web Consortia, W3C, 2003). This work is essential, but it does not address the user end of the experience. In other words, these guidelines were drafted for a "universal" user—one who has the latest software and hardware and knows how to use them deftly. The user end of the experience has been predominantly examined by mainstream computer professionals, who are only now beginning to grapple with the complexities that the diverse population of users with disabilities brings to the equation (Nielsen, 2001). Only a handful of computer professionals specialize in the experience of visually impaired computer users (Barnicle, 2000; Gerber, 2002; Slatin & Rush, 2003).

Research in the field of visual impairments has, to a large extent, taken for granted that technology has a huge impact on the lives of people who are visually impaired. Many professionals in the field understand, at least anecdotally, that computer use, AT, and access to the Internet can make a tremendous difference in the lives of individuals with visual impairments—improving educational and employment opportunities, enhancing social networks (by e-mail and

online groups), and facilitating independence (with personal access to information). Yet little research, particularly qualitative research, has been conducted to document the importance of computers and computer-related AT, in the lives of individuals who are visually impaired. A few relevant studies (e.g., Brunken, 1984; Craver & Burton-Radzely, 1998; Crudden & Fireison, 1997; Foulke, 1981; Mather, 1994; Obringer & Kemp, 1992) have attempted to document the impact of technology, particularly computer-related AT, on classroom performance, general literacy, job placement and maintenance, and overall quality of life. Other research has begun to document some of the barriers to access (see Johnson, Wolffe, Candela, & Stitely, 2001; Uslan, 1992), but that information is not complete, does not cover how these barriers are perceived, and does not examine the ways in which these barriers can create even greater inequality for people without access to computers in an increasingly digital world.

This article begins to advance the literature on how people think about access to computers. It presents fundamentally exploratory research about how people who are visually impaired get their information on computer-related technology, a subject about which little has been written. What emerged from the study, as often happens with qualitative research, exceeded the bounds originally designed by the Policy Research and Program Evaluation (PRPE) department at AFB. However, to say that it was an opportunistic find does not discount the importance, reliability, or validity of the findings. Rather, the obstacles that people with visual impairments face in obtaining information on computer-related technology have everything to do with understanding the statistics about who uses computers and why (or, for that matter, why not). Moreover, it begins to expand our understanding of *how* this population uses computers. To design more effective programs, target limited resources, and advocate for needed technology, it is necessary to know the ways in which people use computers and what problems they have in trying to do so.

Research design and method

Research objectives

Because computers and AT are frequently cited as the means of overcoming the lack of access to information and other environmental barriers for nonprint readers, we were interested in how these individuals gathered information about AT and the kind of information they might need. We also gathered data on what they considered "benefits" to computer use (how computers were helpful to their lives), as well as what they considered "frustrating" (which aspects presented barriers to becoming complete AT/computer users).

The data presented here are part of a larger project, which touched on some broader research questions: (1) What computer-related AT information does this population need? (2) What information do visually impaired people seek from the web, what do they seek elsewhere, and why do they go to different types of sources for different situations? (3) Are there any existing sources of information that meet this population's needs for information technology, computers, and AT? The project also solicited recommendations for improving an existing AFB publication on technology within this context. (These other findings formed the basis of an internal report.) This article focuses exclusively on the question of benefits and barriers to computer use for people who are visually impaired.

Qualitative methods

AFB's PRPE department conducted four focus groups, designed to elicit information about computer use. Qualitative methods were selected as the most appropriate because we wanted to understand the breadth of the issue, the range and scope, not the frequency of such opinions (for further information on qualitative methods, see Denzin & Lincoln, 1998; Strauss & Corbin, 1998). Furthermore, qualitative methods may be used successfully to collect an "emic," or insider's view, from the group being studied and therefore produce valid descriptions of how the group or participants perceive various phenomena (Patton 1990; Pelto and Pelto 1978; Spradley 1980). In other words, qualitative methods have strong validity (that is, they reflect the concept they are intended to measure; see Rossi & Freeman, 1989). Last, qualitative methods are better than are quantitative methods for probing for information about complex behaviors and in sensitive contexts (see Barnes & Mercer, 1997; Scrimshaw 1990). Moreover, they are appropriate when there is a low frequency of respondents, costs prohibit gathering data in other ways, or one is seeking targeted viewpoints (e.g., the views of AT experts or users who were also teachers). The low prevalence of visual impairment in the United States, particularly among computer users, made this project well suited to the use of qualitative methods.

Focus groups

PRPE conducted four focus groups in 2001: two at the annual conventions of organizations of consumers of services for people who are blind or visually impaired (American Council of the Blind, ACB, and National Federation of the Blind, NFB) and one at the biannual, international conference of the Association for Education and Rehabilitation of the Blind and Visually Impaired; one focus group with subscribers to AFB's publication, *AccessWorld: Technology and People with Visual Impairments,* was conducted by telephone. All the groups were moderated by the author and lasted approximately two hours. The sessions were audiotaped, transcribed, and analyzed using qualitative analysis software, the Ethnograph.

Although the purpose of the focus groups was not to gather consensus on a particular topic (as it is in focus groups conducted for market research purposes), the results presented here indicate that the participants all felt strongly about these issues and were nearly always in agreement (unless where indicated). I was surprised at both the depth of feeling that was evoked and by the degree of consensus that was reached. Clearly, these were pertinent issues to the users themselves.

The data were elicited through an "ice-breaker" question, which was also used in the larger project mentioned earlier: Individuals were asked to identify one way in which technology has either been most helpful or most frustrating to them.

Reliability and validity

Even though the participants were asked one way in which computers were either most helpful or most frustrating, this question opened floodgates, with individuals frequently listing both. This question struck a nerve. It was something these participants felt was exceedingly important and had not yet been discussed this way with others. Although the participants may have engaged in informal venting in electronic discussion groups or among friends, they had not yet had the opportunity to see this as a collective issue faced by others, that is, as a sys-

temic, rather than an individual, problem. Moreover, they had not had anyone "from the outside" inquire about it. The fact that AFB was soliciting information on the subject validated a huge host of issues that they felt had previously lacked a formalized voice. Their outpouring reflected a collective sigh of relief that these issues were finally being heard. In other words, these themes have what qualitative researchers consider both high reliability and validity.

Sample

There were 8–12 individuals in each group, 41 participants in total, representing a diverse group. PRPE gathered as diverse a sample as possible with regard to gender, geographic region, level of computer/technical expertise, degree of visual impairment, and preferred reading method.

The participants were asked how they rated themselves as users of AT, using the following definitions: "beginner" (someone in need of training), "expert" (someone who can give training), and "intermediate" (somewhere in between). Approximately half the participants were experts; less than one fifth were beginners. Half the participants described themselves as "having no usable vision"; the other half varied as to their degree of visual impairment. Half the participants preferred braille as their primary reading medium. With regard to the age of onset, just under half the participants had been blind since birth, and the remainder had lost their sight at about 12 years of age, on average.

The participants were a well-educated group of individuals, the overwhelming majority of whom had at least some college education (more than 85%) and were employed (73%). Thus, in many ways, the sample does not represent the general population of individuals who are visually impaired in the United States. (A more representative sample would have included many more people who were less sophisticated users of technology and many people who were not computer users because of such issues as poverty, socioeconomic status, or a lesser connection to blindness systems (see Kirchner, Schmeidler, & Todorov, 1999). However, the sample much more closely resembles the online population of visually impaired users (see Gerber & Kirchner, 2001b). All demographic information was collected privately by phone. All the names of participants presented in this article are pseudonyms.

Individuals were recruited primarily by electronic postings to electronic discussion groups, such as those hosted by consumer groups (ACB, NFB, and the Visually Impaired Computer Users Group, VICUG), and by contacting members of AFB's Careers and Technology Information Bank (now CareerConnect), a database of blind professionals. These were successful strategies, given that the screening requirements necessitated the use of computers.

Sample bias

Given the project's larger goals, additional efforts were made to guarantee some diversity of respondents, according to the types of potential audiences of *AccessWorld.* That is, within the general requirement that the participants needed to be visually impaired computer users, PRPE targeted subscribers and potential subscribers (e.g., teachers of students with visual impairments, agency workers, and employed and unemployed consumers). Similarly, by scheduling focus groups during other meetings where potential participants would be present, this project was conducted on a shoestring. The sample reflects these phenomena: The partic-

ipants represented groups of visually impaired persons who were easily reachable by researchers, such as those on electronic discussion groups or who worked in the field of visual impairments and, as was stated earlier, do not represent the entire population of individuals with visual impairments in the United States, which would include more people of color; more youths and elderly people; and more people with multiple impairments, including those who are deafblind. The sample is biased toward those with higher education and income. These biases are important: In a sample that was more representative of the visually impaired population as a whole, the problems mentioned by the participants would be much worse and the benefits greater (Gerber & Kirchner, 2001a).

Benefits of computers

Employment

Given that the data were collected from a group of working-age, mostly employed adults, it should not be surprising that the number one reason given by the participants for why technology was helpful to them was in relation to employment. Thirty-five participants (85%) mentioned that they used AT as part of their jobs, and all 35 stated that AT was "very important" to the work they do. This finding is consistent with the findings of other research, which has documented the relationship between employment and Internet access/computer use for people who are visually impaired (Crudden & Fireison, 1997; Gerber & Kirchner, 2001b; Kirchner 1995).

Some participants indicated that they could not do their jobs without computers. Often, they were doing jobs that involved technology. Maria mentioned that technology creates job flexibility; it allowed her to complete her reports either from the office or from home. Annette explained that the benefits of telecommuting allowed her to keep her job:

> I couldn't do my current job without it. I live in Iowa, and [the company is] in Boston, and because of the Internet and being able to send things back and forth—documents and e-mail and all of that—I could take that job with me when I moved. And that would not be possible otherwise.

Independent of the issue of visual impairments, this point demonstrates that in the information age, employment and computer literacy go hand in hand.

What is surprising, however, was the way in which the participants spoke about the improvement in their employment situation as an issue of independence. Certainly, by increasing earnings, employment enhances financial independence. But, in addition, these individuals were able to be more independent at work, as Ray's, Maria's, and Tanya's comments illustrate:

> Ray: Technology's helped me. It has made me more independent in my job because now I can do a lot of my paperwork and retrieve things that once were just paper and a file, and I had to get a reader to put their hands on.

> Maria: I am in the clerical field, and before I got into technology, I was a lot less employable, I guess, because when you type something from a typewriter without the benefit of technology, you have to basically have someone proofread that, and if there are errors in it, then . . .

Tanya: I think it's been very helpful, and I cannot figure out how I did anything in the past, how *I* managed to do anything.

Computers, by virtue of their relationship to employment, do not just create financial independence; they help create an independent identity. The role of employment as a way of creating identity in the United States has roots that can be traced to the New Deal of the 1930s, if not earlier, when federal programs offered unemployed (able-bodied) men the opportunity to "restore their self-esteem, their reputations as family providers, their sense of control over their own destinies" (Longmore & Goldberger, 2000, p. 18). Current cultural attitudes continue to affect expectations about employment: Employment provides social validity and a sense of self or identity, as well as economic security. It is also important to note that this theme of independence ran throughout the discussions on computer use.

Access to Information

Computers and the Internet have improved access to information, and for people who are visually impaired, access to information can enhance their knowledge, independence, and opportunities for equality. Patrick, Jalen, and Ray demonstrated how the information revolution is not simply about more information, but is about independent access to information:

Patrick; It's really neat to be able to go online if you want to read the newspaper or look up a phone number and do that independently without having to have sighted assistance.

Jalen: I'd say that technology has made me more independent. . . . Access to the Internet has allowed me to read things, the news, articles and classifieds, things like that more independently and not having to wait on someone else to read it to me.

Ray: Walking through a library used to give me a very eerie feeling—just all the knowledge and the history and everything that was there that was out of my reach—and now I feel with the Internet that things are once again in my reach.

This may be one reason why visually impaired computer users spend more time online for certain tasks than do their sighted counterparts (NTIA, 2002).

Because computers enable people to have instantaneous access to information and allow individuals to read for themselves, their use is integral to learning outcomes and literacy. Maurice made this point, illustrating how electronic access allowed him to get his educational materials at the same time as his sighted peers and to increase the efficiency with which he was able to work:

They were able to scan my books ahead of time that the professors required for my classes and get them in time, which was really good because when it came to studying, I just had to do word searches to go to any specific topic that I needed, rather than try to listen to a whole tape.

Natalie, a blind professor, mentioned how the technology boom has meant freedom for her, the liberating aspect of being able to read for herself palpable in her tone: "Because work is conducted and submitted dig-

itally, I no longer have to have someone read my students' papers to me." Jan described a similar sentiment: "When I found out that the braille output was available, now I don't want anything to do with the speech. . . . I'd much rather read it and see it for myself." AT, in the form of screen readers, braille outputs, optical character recognition systems, and screen magnifiers, enables people to read for themselves.

The importance of being able to read for oneself cannot be overstated. It is liberating, allowing independent access to the mainstream world where previously none existed, and because of its relationship to literacy, reading improves individuals' writing skills. Patrick illustrated how this latter process is enhanced through electronic media: "The technology has given me a channel, to channel my creativity into something positive." Ray was even more explicit about how this process works. He said: "It's helped me with one of my hobbies, which is writing. Now I can read what I've written, . . . store it, come back [to it], and have access to reference volumes I've never had in the past." Patty, too, discussed how computer technology enabled the quality of her writing to improve:

> Like a lot of the others have said, I really appreciate the technologies given for e-mail and transferring of information, receiving of information, but for me, the most powerful thing that has really revolutionized so many things in my life is word processing. I absolutely love word processing—you have so much control of your data, and I think it's just a wonderful thing.

Noreen, who has low vision, emphasized the benefits of screen-reading software in this regard: "I'm better in some ways at writing now that I'm not looking at the screen, now that I'm using JAWS." Gary, a blind professional, indicated that his writing had improved as a result of word processors, as had his job performance, and with tangible results:

> I guess the greatest use I have for technology is word processing, writing grants. . . . I, like Julie, I don't know how I would ever be able to write all these grants without talking computers. I remember a gazillion years ago, my first couple of grants were written with literal cutting and pasting actually with scissors, and I just can't imagine doing that now. So that is a tremendous help, and it's actually brought in about $10 million.

Writing is essential to success in modern life. However, it carries an added weight for this population, since people who do not have access to print find it more difficult to attain literacy skills. Maria explained it this way: "Technology has been really good for me. . . . I've been able to communicate with people. I'm not a good letter writer because I can't even read my own [hand]writing, [and] half the time, nobody else can either, so being an e-mailist is really nice."

Social/Community Networks

Computers have also enhanced the social networks available to people who are visually impaired. The participants' comments demonstrate how profoundly important the role of computers has been in overcoming social isolation. Patrick was quite out front about his personal situation:

> I think that the overriding benefit that I have received from access technology

> is relief from a very traumatic past. I was one of these people that came up in a school for the blind and academically got a good education with what was around back then, but socially there were a lot of problems. . . . I have told people time and time again that had the Internet and this technology been around back in the 70s when I was coming up in school, I think it could have gone a long way to alleviate a lot of the social trauma and situations that I had to deal with when I was growing up.

The participants said that the ability to send and receive e-mail and to participate in online chats and electronic discussion groups allowed them to develop a greater sense of community and social networks than they had previously been able to do. These findings are consistent with those of other research that has demonstrated that people with disabilities are more likely to say that computers help them to "feel connected to the world" and "to reach out to people with similar interests and experiences" than are people without disabilities (Taylor, 2000a). This finding may reflect the fact that people with disabilities are more likely to start out feeling socially isolated (Taylor, 2000b).

The additional challenges faced by people with visual impairments make attention to this aspect of computer use particularly salient. Time and again, the participants said how much they valued the ability to meet other people, to find a community of people "like themselves," and be able to communicate with people about common issues of concern. As Tanya, for example, put it: "I think my most positive part of the technology is the intercommunication, or I might say, the breaking of that isolation bond that tends to exist in the blind community with the Internet, not on just a national basis but an international basis." Ray also appreciated being able to connect with others far away: "It has allowed me more access to the world and communication with people from all around the world." Eva put it succinctly: "I'm a lousy letter writer, but I love e-mail."

Because visual impairment is such a low-prevalence condition, the issue of community has particular salience for individuals with visual impairments. The relationship between computer use and quality-of-life indicators, as well as the role of computers in opportunities for mentoring and advocacy, ought to be explored further.

Barriers to computer use

Lack of training and accessible training materials

Consumers who are visually impaired and professionals in the field of visual impairments have long been aware of the lack of adequate computer training. Johnson et al. (2001) documented that the shortage is at a "crisis level," and certainly there have been many efforts to address this need; one such effort is *AccessWorld,* whose goal is to provide computer-related information, including evaluations of products and tutorials. The participants' concern about the lack of training, the cost of available trainers, and the lack of ongoing information that would allow people to "train themselves" was great. Sharon's comment addressed the lack of adequate and affordable training: "Probably the most helpful and the most frustrating both is that fact that I'm using it for e-mail and the Internet, but my knowledge right now is very limited, so I can only go to a certain scope, and that's probably the most frustrating."

The issue of training for people who are visually impaired was frequently compared to training for sighted people, as Noreen's comment illustrates: "Well, I think a frustration, too, is that when people need help, it's really hard to get help, whereas for sighted persons, it's real easy . . . for them to get the help they need." Miguel elaborated on how the training needs of visually impaired and sighted people differ because the perception of what appears on the screen differs:

> Unless somebody walks me through it the first time or second time . . . instead of simply telling me, "Oh, you just need to go to a certain site, just use a search engine and look this up or that up." . . . A sighted person can look on the screen and kind of walk through things pretty easily; they see the whole picture. When we go to a web site, we aren't seeing it. We're seeing it in little bits and pieces, and so we're having to kind of formulate what is really there and what it all means. So sometimes when you go to a new site, it's meaningless. . . . And that can be really frustrating.

This is particularly true for people who came of age prior to the existence of the Internet or who lost their sight before they had seen a web page.

Noreen raised the point that most sighted users today are unfamiliar with keyboard commands, let alone specific speech software programs. She called this "a different mindset":

> OK, but I think that's really a frustration for people to be able to get the help they need, especially if you have a sighted person that's trying to help you and to communicate to you what you do to get something done, because you're using a totally different mindset than what a sighted person is used to using with it.

The participants mentioned a "logjam" in training needs because technology companies are not obliged to provide training or even accompanying documentation in an accessible format. Eva expressed her frustration with this situation:

> One of the things that makes me really upset is to get a product from an outfit that serves the blind, and everything's in print. . . . I want to hit 'em with something at that point. . . . Or they do the manual, in part, and I feel that as a purchaser, I have a right to the entire manual in an accessible format.

Betsy, an instructor of students with visual impairments said: "Oftentimes technology is just sitting there because we do not have the ability to figure out everything. If we could even have two hours of time from a vendor that has sold it, that really knows it, at least that could get us started." Another participant blamed companies' lack of responsibility on the fact that there is so little competition, that this is why they can get away with not offering technical assistance or quality, accessible manuals. Gary complained: "Manuals . . . documentation. . . . It's really so poorly written, it's unbelievable, and I can't blame the teachers who don't have a good background in technology in the first damn place, and then they pick up these manuals that are. . . . These guys are the worst writers in the world."

Sheila noted that it was not just that the manuals are poorly written, but that they contain inaccurate information:

> First of all, they're so close to it that they don't write in a detailed fashion enough, and sometimes they can't write well enough, so that it's wrong in the manual. I have had to, for example, to make Braille 'n Speak usable by our students. . . . I've gotten my own Braille 'n Speak lessons. Again, the vendors should employ professional manual writers, but they don't.

Maurice concurred and explained how he circumvented the problem: "I take tutorials on certain topics that have been done, not by the vendors, but by other blind guys who are really into it, and usually those are better." Although it is generally true that technical manuals for people who are sighted are poorly written as well, this issue has greater salience for people who are visually impaired, since there is not an equivalent of the plethora of "Whatever for Dummies" titles for various aspects of AT. Simpler translations and technical help are becoming increasingly available within the visually impaired community, although one must have a degree of computer literacy to access many of them. As Patrick explained:

> Web-based training programs that some people are running, those are fine if you know enough of what to do to get yourself on the Web and into the class. But if you don't know enough of what you're doing to do that, then those things are shut off to you, and if you do know enough to get into that, then maybe you don't need those classes so much. So it's kind of a catch-22 in that respect.

Moreover, access to training and information needs to be ongoing as newer versions and products come on the market. John said that people who have sought computer training, independent of basic rehabilitation, have found it difficult to obtain training through public rehabilitation agencies: "For a lot of blind people who want in on the technology, training is hard to get. . . . People that are coming into computers later, just because they aren't in the rehab system, [it] shouldn't mean they should be shut out." The participants explained that one often ends up having to pay privately for training, which is both unregulated and expensive. The prohibitive cost of training was frequently cited as a reason that prevents people from acquiring computer skills. Private training can cost $50–$60 per hour, a prohibitive amount for many unemployed people who are visually impaired.

The participants who tried to teach themselves new technology skills said they were frustrated by the amount of time it took to do so. Sheila said: "It takes a lot of impetus and energy to go and find that information yourself, and there are people out there who don't have the energy to do that, or the time to focus on that, so they don't search out this information." Julie put it simply: "The frustrating part is I want to do more, and there's not enough time. I need about four of me." These concerns resonate strongly because this was a well-educated group of intermediate or high-level users: Most had not received any formal training in AT.

Lack of Access and Fear of Being Shut Out

Complaints about inaccessibility were often framed in terms of unequal access for visually impaired and sighted users. The participants expressed their frustration about having to depend on assistance from sighted people. Tanya noted that even with

her level of proficiency with computers, she has to depend on such assistance:

> The most frustrating part about it is not being able to install Windows by myself because I worked in the DOS world for 15 years, and it was nothing for me to format a drive and reinstall my DOS programs and stuff, but I cannot [do so with Windows]. . . . I don't know any who are able to format their drive and do Windows cold turkey, and when [I] have to call on a sighted person, sometimes at so much an hour, that just kills me.

Ron added: "The whole process of having to pay for information that's available for free really bothers me."

Unequal treatment of visually impaired and sighted people was not limited to differences in costs. Renée raised the point that what is perceived as an acceptable level of quality differs, too. That is, what is deemed "good enough for the blind" would be unacceptable for the sighted:

> Blind people have to put up with technology that the sighted person wouldn't tolerate. You know, even optical character recognition has a 98% accuracy and a 2% failure rate possible, and sighted people wouldn't put up with that. And there are [other] issues that sighted people wouldn't tolerate, but that the blind have to, to get to where they need to go.

Not only is there a lower level of acceptable quality, but the ability to compare differences among products is also minimized. Patty explained: "Sighted people can go to the mall or go to a computer shop that specializes in computers or technology, and they can kind of do some comparison and shop through computer books, computer users' books, and so on; we really . . . aren't able to go try things out." Sylvia reinforced what she considered hidden discrimination:

> My feeling is, I know this sounds totally ludicrous and probably sighted people think I'm crazy, but I personally look forward to advertisements [in publications] because that's something that we never get to read. . . . We don't have access to it. . . . Y'know, the sighted world, most people compare products based on advertising, but we . . . that's just another avenue that we don't get to take, to learn about products. [To be considered "free matter for the blind" and sent postage-free via the U.S. postal service, mail may not contain advertising.]

The lack of available, accessible information and the inability to choose from a wide variety of products or to comparison shop for the products that do exist means that people who are visually impaired have to accept "whatever is out there." It also means that they have to spend a greater amount of time redressing technological glitches. In other words, AT users must spend more time, energy, and money learning what technology exists, how to use specific software programs, and how to overcome compatibility problems than do users of mainstream products—all with the presence of even less technical help. Gary summarized this frustration: "Even though I have access, much more access, I still don't have the same access to the screen, and that's a frustration. I have to learn a hell of a lot more than sighted people to be able to

do the same thing, and so that's my biggest frustration, I guess."

Computers and AT may have unlimited potential, but in the current state of affairs, technology is incredibly frustrating, in part because users know what they are missing. As Ray stated: "The frustration is probably just how some of our access technology, y'know, today doesn't give us full access to everything on the Internet that others have. It's getting better, but still folks are doing some things that I can't do yet."

Moreover, the participants expressed real concern that this problem was going to get worse, that they were going to continue to be shut out of further advances as the world becomes increasingly digital. John brought up this fear in a discussion of low-tech items:

> With the advent of technology, the way digital stuff is coming out, accessibility is a big issue. I don't know if any of y'all have purchased stereos lately, but they're all menu driven. Even your appliances are getting to be where they're digital, something as basic as a stove, I mean, good grief! So we're going to be shut out of a lot of fields, a lot of things, even in our own homes. These low-tech devices, such as your dishwasher, your refrigerator, you can't set the settings on them no matter what they might be.

John's comment provoked a great deal of discussion among the participants of that focus group. Obviously it had struck a nerve. Jan added:

> The copiers in my office are like that, and so there are certain things I can do . . . the keypad itself, the numbers are still buttons, but if you want to select different options, like to collate and staple and all that, it's all digital behind the glass. . . . My microwave is like that, but there's one thing for every button, so you can put Dymo tape [braille or large-print adhesive used for labeling] over it, but these [on the copier] are like a menu. You push it once, and it's one thing, and you push it again, and it's something else, so I can't use those at all. It's like . . . when they put this braille on the bank machines, but you can't read the screen.

Jan mentioned that getting information on low-tech items, such as magnifiers and tape recorders, on an ongoing basis was even more difficult. Violet acknowledged: "That's even harder; that's just not out there."

The points made by the participants illustrate the various impediments to achieving access that people who are visually impaired currently face and demonstrate that, at this point, the problems are still greater than the solutions.

A brighter future?

One person's luxury may be another person's need; for some people, a computer is a luxury, but for somebody else it's a real need, like us. (Comment by a participant)

Because computers, related AT, and the web have added value for persons who are visually impaired (Gerber, 2002; see also Gerber & Kirchner, 2001a), users often tolerate, to a greater degree than otherwise would be expected, the many and varied frustrations they encounter, even on web sites that meet the technical standards of accessibility and even among supposedly accessible products. They are willing to tolerate incredible frustration, high costs,

and time-consuming and imperfect technology and to overcome these barriers because of the benefits. However, the benefits of computer technology are obviously available only to individuals who are able to avail themselves of this technology. Special attention should be given to the range of barriers that the participants discussed, especially if programmatic efforts are aiming to bring the other four fifths of the people with visual impairments online.

Having access to the Internet and becoming a regular computer user are critical because of their positive impact on literacy, education, employment, and quality of life. However, further research is needed to determine the direction of the causal relationships so as to design appropriate interventions. For example, in the case of employment, it seems that employment itself is a predictor of computer use (Gerber & Kirchner 2001b; Johnson et al. 2001), yet equipping individuals who are visually impaired with computer skills will enable them to participate competitively in the labor market.

Because the potential exists for computers to balance some of the effects of visual impairment and give visually impaired individuals equal opportunity to achieve in productive ways with sighted individuals, "getting wired" should be an integral part of the so-called core curriculum for children and a required part of all vision rehabilitation for adults. As the world becomes increasingly digital, standing in place will mean being left behind.

References

Ayers, E. (2000). Cyberspace, U.S.A. [Electronic version]. In W. E. Leuchtenburg (Ed.), *American places: Encounters with history* (pp. 1–39). New York: Oxford University Press. Available: http://www.oup-usa.com/sc/019513026X/019513026X_02.pdf

Barnes, C., & Mercer, G. (1997). *Doing disability research.* Leeds, England: Disability Press.

Barnicle, K. (2000). Usability testing with screen reading technology in a Windows environment. *Proceedings of the Conference of the California State University at Northridge Center on Disabilities.* Available: http://www.csun.edu/cod/conf/2000/proceedings/0073Barnicle.htm

Brunken, P. (1984, April 23–27). *Independence for the visually handicapped through technology.* Paper presented at the 62nd annual convention of the Council for Exceptional Children, Washington, DC.

Craver, J. M., & Burton-Radzely, L. (1998). *Technology links to literacy: A Case book of special educators' use of technology to promote literacy.* Calverton, MD: Macro International.

Crudden, A., & Fireison, C. (1997). *Employment retention after vision loss: Intensive case studies.* Washington, DC: National Institute on Disability and Rehabilitation Research.

Denzin, K., & Lincoln, Y. S. (1998). *Collecting and interpreting qualitative materials.* Thousand Oaks, CA: Sage.

Foulke, E. (1981). Impact of science and technology on the early years. *Journal of Visual Impairment & Blindness, 75,* 101–08.

Gerber, E. (2002). Surfing by ear: Usability concerns of computer users who are blind or visually impaired. *AccessWorld, 3,* 38–43.

Gerber, E., & Kirchner, C. (2001a). *Social Research on use of, and preferences for <www.medicare.gov> by people who are blind or visually impaired.* Unpublished report, Department of Policy Research and Program Evaluation, American Foundation for the Blind, New York.

Gerber, E., & Kirchner, C. (2001b). Who's surfing? Internet access and computer use by visually impaired youth and adults. *Journal of Visual Impairment & Blindness, 95,* 176–181.

Johnson, G., Wolffe, K., Candela, T., & Stitely, J. (2001). *Wired to work: An analysis of the reported crisis in access technology training for people with visual impairments.* Technical brief presented at the Josephine L. Taylor Leadership Institute, March 27, 2001.

Kirchner, C. (1995). Economic aspects of blindness and low vision: A new perspective. *Jour-*

nal of Visual Impairment & Blindness, 89, 506–513.

Kirchner, C., Schmeidler, E., & Todorov, A. (1999). *Looking at employment through a lifespan telescope: Age, health, and employment status of people with serious visual impairment.* New York: American Foundation for the Blind.

Longmore, P., & Goldberger, D. (2000). The league of the physically handicapped and the great depression: A case study in the new disability history. *Journal of American History, 87*(3) [Online]. Available: <www.historycoop.org/journals/jah/87.3/longmore.html>.

Mather, J. (1994). Computers, automation, and the employment of persons who are blind or visually impaired. *Journal of Visual Impairment & Blindness, 88,* 544–549.

National Telecommunications and Information Administration. (2000). *Falling through the net: Towards digital inclusion. A report on Americans' access to technology tools* [Online]. Available: <www.ntia.doc.gov/ntiahome/fttn00/Falling.htm#61>.

National Telecommunications and Information Administration. (2002). Chapter 7: Computer and Internet use among people with disabilities. In *A nation online: How Americans are expanding their use of the Internet* [Online]. Available: <www.ntia.doc.gov/ntiahome/dn/html/Chapter7.htm>.

Nielsen, J. (2001). Beyond accessibility: Treating users with disabilities as people. *Jakob Alertbox* [Online]. Available: <www.useit.com/alertbox/ 20011111.html>.

Obringer, S., & Kemp, S. (1992). *The effect of computer technology by braille students on instruction time.* Paper presented at the annual meeting of the Mid-South Educational Research Association, Knoxville, TN.

Patton, M. Q. (1990). *Qualitative evaluation and research methods.* Newbury Park, CA: Sage.

Pelto, P., & Pelto, G. (1978). *Anthropological research: The structure of inquiry.* New York: Cambridge University Press.

Rossi, P., & Freeman, H. (1989). *Evaluation: A systemic approach.* Newbury Park, CA: Sage.

Scrimshaw, S. (1990). Combining quantitative and qualitative methods in the study of intrahousehold resource allocation. In B. L. Rogers & N. P. Schlossman (Eds.), *Intrahousehold resource allocation: Issues and methods for development policy and planning* (pp. 86–98). Tokyo: United Nations Press.

Slatin, J. M., & Rush, S. (2003). *Maximum accessibility: Making your website more usable for everyone.* Boston: Addison-Wesley.

Spradley, J. P. (1980). *Participant observation.* New York: Holt, Rinehart & Winston.

Strauss, A. L., & Corbin, J. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (2nd ed.). Newbury Park, CA: Sage.

Taylor, H. (2000a). How the Internet is improving the lives of Americans with disabilities. *The Harris Poll, 30.* Los Angeles: Creators Syndicate.

Taylor, H. (2000b). Many people with disabilities feel isolated, left out of their communities and would like to participate more. *The Harris Poll, 34.* Los Angeles: Creators Syndicate.

U.S. Bureau of the Census. (1999). Internet access, computer use, and disability status: 1999. *Survey of Income and Program Participation (SIPP),* unpublished tabulation [Online]. Available: <blue.census.gov/hhes/www/disable/dissipp.html>.

Uslan, M. (1992). Barriers to acquiring assistive technology: Cost and lack of information. *Journal of Visual Impairment & Blindness, 86,* 402–07.

World Wide Web Consortia, W3C. 2003. *Web Accessibility Initiative* [Online]. Available: <www.w3.org/WAI>.

Elaine Gerber, Ph.D., *senior research associate, Department of Policy Research and Program Evaluation, American Foundation for the Blind, 11 Penn Plaza, New York, NY 10001; e-mail: <gerber@afb.net>.*

