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October/November 1999 Issue

Focus on diversity
Tech pros with mobility impairments are pushing the envelope
By: Elizabeth Duvivier, Senior Contributing Editor

Today's technological advances continue to level the playing field for people with disabilities. Technical professionals with mobility impairments can pursue a wide range of professional opportunities, thanks to the variety of assistive hardware devices and software that make computers accessi-ble and help with other work-related tasks. Soon computers and other electronic equipment will be even more accessible. Federal lawmakers recently passed legis-lation requiring equal access to electronic and information technology (E&IT) for people with disabilities.

The legislative picture
Amendments to the Rehabilitation Act of 1973 were signed into law as part of the Workforce Investment Act of 1998. Specific changes to Section 508 are intended to enforce laws that promise parity for people with disabilities. On July 14, 1999, the FCC responded to the law by adopting a Report and Order addressing accessibility issues with telecom services and equipment. These changes, along with the rising number of innovative developments in assistive technology, are good news for mobility- impaired engineers and IT professionals.

Of help to everyone
The development of accessible telecom and imputing products and services benefits everyone, not just people with disabilities. In an article for the Association of Access Engineering Specialists, Steven Jacobs, a senior technology consultant at NCR (Dayton, OH), points out that many inventions we use every day were originally created as assistive devices. Microphones, Voice recognition engines, text speech synthesiz-ers and even the telephone began as what Jacobs calls "electronic curbcuts."

AT&T's Steven Fisher: low tech support
Not all high-tech professionals need high-tech support. Sometimes there are simple solutions that will do the job. For Steven Fisher, an aluminum hand brace is all he needs to do his work. "My accommodations are very simple," says Fisher, who is Southern Region deploy-ment manager for Y2K and Tivoli with AT&T (Alpharetta, GA). "I do have an at-tendant with me who acts as my assistant, but with a typing stick that attaches to my brace, I am able to use the computer."

Fisher says the only time he had a specific problem was when he needed to use special characters that required holding down two keys at once. AT&T supplied a modified keyboard that solved the problem. When he started college in 1972, Fisher intended to become an anesthesiologist. His career plans had to change following a 1974 car accident that left him with severely limited mobility. He spent more than eight months in the hospital. Soon after he got home, he enrolled at the University of North Carolina (Wilmington, NC) to study psychology, with the goal of becoming a rehabilitation counselor.

Into IT
He graduated in 1979 and received a full scholarship to attend a masters program at the University of

North Carolina (Chapel Hill, NC). But after a couple of months, he realized his heart wasn't in it. "I was doing what I thought I could do, but not what I wanted to do." Fisher had some heart-to-heart talks with his sister, an IS manager. After visiting her at work, and with her strong encouragement, he returned to Chapel Hill to study computer science. Later he was the first out-of-state student to be accepted into the Georgia Computer Programmer Project, a training program for people with disabilities. The project, located on the campus of Georgia Tech (Atlanta, GA), was sponsored by twenty-one companies. AT&T was one of them. When he completed the course in 1983, Fisher went to work for AT&T and has been there ever since.

Consolidating data centers

AT&T started Fisher with a four month design training class. Then he was moved to an assignment in finance as a Cobol pro-grammer for subsidiary company accounts. After three years he shifted into mainframe tech support, working on a data center consolidation project. At the time, AT&T had twelve data centers across the U.S. "We had to get twelve centers operating in a similar fashion and standardize the job control lan-guage they used," explains Fisher. The next stage of the project was con-solidating the centers. In all, the project took five years. When it was completed, the twelve centers had been consolidated into the two large processing centers AT&T runs today in Orlando, FL and Alpharetta, GA.

New challenges

In 1993, Fisher was asked to start a pilot program in the company's Premises and Desktop Support division, providing both hardware and software support. He was also responsible for helpdesk activities. In his current deployment work, Fisher, along with three other people, is responsible for AT&T's PC operations in eleven southeastern states. The initial assignment was to ensure Y2K compliance. This meant gathering and assessing inventory, as well as remediating both hardware and software. As part of the compliance effort, Fisher's team is deploying IBM's Tivoli PC network management program. Tivoli allows Fisher and his team to automatically distribute Y2K software, make patches and fixes to client workstations, and provide services, all through a remote control agent. It's a big project that calls for an enormous amount of organization. But Fisher revels in the challenge. “What I’ve always loved about my career is the diversity of my assignments. I’ve always had the opportunity to move on to new challenges,” he says.

Dae Yoo of Caltrans; firsthand knowledge

Dae Yoo lost his legs when he was six years old and uses an electric wheelchair. He graduated from the University of California (Davis, CA) with a BS in materials engi-neering in 199 1, but it wasn't until 1993 that he found the exciting and challenging position he had hoped for. That happened when he was hired as a civil engineer by the State of California Department of Transportation (Caltrans, Sacramento, CA). Today he's an assistant project coordination engineer there. "Once I got into this field I wished I had studied it in college," says Yoo. "Instead I had to do a lot of research and reading on my own to catch up and get up to speed." His first assignment was as a bridge de-sign engineer in the department of struc-tures design. His team designed new bridges, and retrofitted existing bridges for earthquake resistance. While still in structures design, Yoo had the opportunity to work in the construction department for six months. Part of the job involved going on site to inspect the work . "Usually, the inspector drives a compa-ny pickup truck that is designed for site use," says Yoo. "Obviously, I couldn't use it since I need a hand-controlled vehicle, so I would drive my own car." He found the experience stimulating, and continues to draw on the firsthand knowledge he gained on

construction sites.

Into management

After nearly five years in bridge design, Yoo moved into the division of program/project management. "In bridge design we only deal with a portion of a project," says Yoo. "But here, I get to see the bigger picture. That's the part I like best. I enjoy seeing how a project is started and carried through all the different cycles to completion." Yoo's primary responsibilities are sched-uling projects and allocating resources. "I act as a liaison between the project managers and the function managers," he explains. Once a month, Yoo flies down to San Bernardino to meet with project managers in the southern part of the state. At first the idea of plane travel was intimidating. It had been nearly eighteen years since Yoo had flown and he was nervous. "My first trip, I went with one of my co-workers because I wasn't sure how it was going to work," he remembers. But everything went smoothly. "The flight at-tendants were able to help me into my seat and my chair travels with me. So it worked out perfectly."

Microsoft's Greg Smith: every keystroke is precious

Greg Smith was injured playing football in his sophomore year of college. Since then, he has had some control of his shoulder muscles, but no use of his legs, hands or fin-gers. He relies heavily on assistive technol-ogy to support his career in software design. Smith received his BSCS from Stanford University (Palo Alto, CA) in 1992 and his MSCS in 1994. Then he went to wok at Microsoft (Redmond, WA) as a software design engineer.

Since then he has been involved in a number of different projects, all in the area of data access. He's worked with Visual Fox Pro and Microsoft Access Compo-nents, and now he's in SQL Server. "The technical challenges with data ac-cess involve understanding both abstract database theory and end-user require-ments, and figuring out a way to marry the two very different worlds," Smith explains. "You have to provide a good user experience without relaxing any strict data re-quirements or cutting people off from the power of their low-level data tools." Right now, Smith is a development lead in Microsoft's data access group. Together with his team of four programmers, he cre-ates components for Windows 2000. Smith uses several assistive tools to help him do his work. He wears a splint on his right arm that ends in a pencil eraser, which he can use to type code. He wears a HeadMaster laser-based headset mouse made by Prentke Romich (Wooster, OH) that tracks his head movements with a laser beam. Then, to click on an object or icon, Smith puffs into a tube. With this complex support system, Smith has developed his own special approach to coding. "A lot of programmers will sit down and start writing and rewriting things until they have solved the problem," he says. "For me, every keystroke is precious, so I tend to work out all the problems in my head before I begin writing."

A very stimulating environment

Smith hadn't yet declared a major when he was injured. He says he probably would have gone into software design in any event. "I really like to work with smart people and my work has me positioned in a very stimulating environment." Though he once considered tele-commuting, "I realized early on that it is a lot more fun to be in the office ' " Smith says. "To roll down the hall and chat with people is one of the nicest parts of my job." Down the road, Smith isn't entirely certain what direction his career will take. "My question for the next few years is do I want to keep moving up on the management side, or stay purely technical." Fortunately, Microsoft's dual career ladders can lead to seniority in either direction.

David Ryan Wishum: professional support from IBM

David Ryan Wishum is also a software engineer, and a programming lead for his team at IBM (Raleigh, NC). Wishum has cerebral palsy, and although he is able to walk with a cane, he uses an electric cart at work because it helps him get around faster with less fatigue. Wishum, who cannot speak clearly because of his cerebral palsy, also uses an electronic communicator made by Zygo Industries (Portland, OR). The communicator, he says, is a marked im-provement over the laptop he had pre-viously used to communicate with his colleagues.

The laptop, with its soft-ware key and speaker, was "aggravat-ing to lug around." In contrast, the communicator is a much smaller single unit. "IBM has provided me with any special equipment that I need ' " he says. Wishum joined IBM in 1998 fol-lowing graduation from Georgia Insti-tute of Technology (Atlanta, GA) with a BS in computer engineering. "When I interviewed with IBM, they made me feel I could fit into the company and offer something to it." I had heard how well IBM treats employees with disabilities, but it was not until I was hired that I found out how true that was. IBM supports my professional goals by encouraging me to take classes to improve my skills, and also gives me great assignments."

A career in testing

Wishum works in the IBM Netfinity Server functional verification testing department, where he's responsible for test design, development and imple-mentation. He develops test code and test cases for both hardware and soft-ware functions of the Netfinity Server service processor. Early in 1998 he worked on the re-lease of a low-end server. "I was asked to help the tester analyze and deter-mine the source of the problems," he explains. Recently he worked with another programmer to convert some internal IBM code to SCO Unix. Part of his job was to organize and schedule the programming tasks and keep the team on track. He did so well that he was offered the programming lead position he currently holds. "As programming lead, I help plan what we need to do and delegate the work," says Wishum. "I also maintain our core libraries which house our test programs and write any new tools that a project might require."

IBM's Hank Torres: "The mouse was my downfall"

"The mouse was nearly my downfall," says Hank Torres. But with IBM's sup-port, he was able to continue hl s ca-reer as a software programmer even after the arrival of PCs eliminated the use of text-based applications. After completing his BSCS at the University of Illinois (Champagne, IL) in 1983, Torres joined IBM and relo-cated to Austin, TX. His job was to write software for a number of computer-aided design projects. Although Torres is quadriplegic, he can type by using the eraser end of a pencil attached to a hand splint. He was able to program very effectively, he explains, because the text-based software of the early 1980s used only a keyboard for input. "Then PCs came along with graph-ical user interfaces. They require point and click capability and this was really difficult for me since my hand are paralyzed," he explains.

IBM stood behind Torres, sending him to a number of trade shows where he found assistive devices that would help him continue his career. His first purchase was the Head-Mouse, made by Origin Instruments (Grand Prairie, TX). HeadMouse was a dual-lens infrared sensing device that tracked the movement of his head. Torres used it until upgrading to a more sophisticated instrument called Tracker, which has a single-lens sensing device and a number of settings that can be adjusted to the user's specific needs. Tracker is made by Madentec Ltd (Ed-monton, Alberta, Canada). Torres also

uses Madentec's Wireless Interface Sip and Puff (WISP) switching device to send his left/right mouse clicks to the computer. "I can be five feet away from my computer and still have complete control of it, using the Tracker and WISP combination," says Torres. He activates the switch with a light puff into a rubber tube. Torres credits the products he found with saving his career, and IBM for helping him find them. "Tracker and WISP completely changed my life," he says. "I absolutely would not be able to use a computer without them." Now that he's retired from IBM, they continue to enhance his daily life.

Robert Chappell: developing Quick Glance

Electrical engineer Robert Chappell knows firsthand how devastating a mo-bility impairment can be if an appro-priate assistive device is not a, That's what led him to develop Quick Glance and start EyeTech Digital Sys-tems (Mesa, AZ), the company of which he's president. Chappell is an electrical engineer. Back in 1992, he was working long hours at his keyboard, pushing to com-plete a programming project. He woke up one morning to find his excessive use of the keyboard had injured the tendons in his arms. "Though I had used the keyboard constantly for years," says Chappell, "I did the dam-age in one three week period."

The tendonitis turned out to be per-manent, making it impossible for him to use a conventional keyboard. He tried to work with a speech-recogni-tion system, but he found it awkward and developed frequent laryngitis. Then he thought about an eye-con-trolled computer. He had seen one demonstrated years before, but it only ran DOS and was very expensive. "I decided to develop software that would run in Windows and could replace a mouse," says Chappell. In his Quick Glance system, a small camera flanked by infrared lights is mounted at the bottom of the monitor housing. The camera captures images of the eye about ten times a second, and sends the images to the computer where they are digitized, processed, and used to control the cursor. The system is very sensitive. Chap-pell notes that technical professionals have learned to use it to write code for computer aided design and drafting. The main limitation of Quick Glance is the very small field of view of the camera - just 4x4 centimeters. This means users must keep their heads still and their eyes tightly focused which takes some getting used to. Nevertheless, many Quick Glance users consider the tool a lifesaver. The system was released in 1996 and has been in high demand ever since. In addition to running EyeTech, Chappell works part-time as an engineer generalist in the reconnaissance systems operation of Lockheed Martin Management and Data Systems (Goodyear, AZ).

Trace R & D: continuing accessibility research

At the Trace Research & Design Center of the University of Wisconsin (Madison, WI), research focuses on how to make computers and information and telecom systems more accessible to people with all types of disabilities. Over the years, Trace researchers have worked directly with hardware and software manufacturers to implement accessibility strategies. For example, they worked with Microsoft to develop the built-in accessibility features in its operating systems. Though the adaptive devices that Trace helps to develop are intended for the general public, IT and engineering professionals find them useful over a wide range of sophisticated work. Ate Vanderheiden, program manager at Trace, points out tat “accessibility issues are usually a matter of hardware, not software.” For example, an engineer develop-ing microchips with on-screen ASIC design software can employ the same infrared pointing device used for word processing. All that's required in either case is a PC equipped with adaptive hardware to read the infrared signal.

Company support and resources

New developments in assistive and augmentative devices continue to im-prove working conditions and oppor-tunities for technical professionals. An-other part of the equation is the support and resources of a concerned employer. Corporations across the country are working hard to create an environment that accommodates the specific needs of mobility-impaired employees. " I can only speak from a personal perspective, but I do believe that with-out that it is still difficult ' " says Elizabeth P. Dixon, manager of EEO/ Affirmative Action and diversity for AT&T Network Services (Basking Ridge, NJ). "Unless your network is really good," Dixon comments, "it seems you still have to prove yourself more than other people do."

Dixon is national secretary for Individuals with Disabilities Enabling Ad-vocacy Links (IDEAL), a business re-source group at AT&T. IDEAL supports its members with mentoring and net-working opportunities. It also maintains an internal website where members can find information on legislation, policies resources and conferences. In August 1999 IDEAL partnered with Hispa, AT&T's Hispanic business resource group, to host a professional development conference in San Anto-nio, TX. Several senior executives were in attendance. Sophisticated assistive tools, legisla-tive initiatives that encourage E&IT research and supportive employers ready to offer equal opportunity: the technical people interviewed for this article, and many more like them, are building these into challenging careers and bright futures. D/C

Assistive devices used by tech pros
These companies and the tools they supply were mentioned by technical professionals interviewed for this article.

Assistive Technology, Inc - (Newton, VIA) 800-793-9227, 617-641-9000 www.assistivetech.com
Products to help people with learning, communication and technology access diff icul-ties. WriteAway enhanced word processing; Eye-ware visual computer control-, MultiPhone hands-free telephone access; MultiVoice portable speech synthesizer; and LINK, the "keyboard that talks."

D.J.Technical Sales, Ltd - (Vancouver, 13C, Canada) 800-361-8255, 604-436-2694 www.djtech.com
A mounting system used to position augmentative communication systems, portable computers and trays.

Dragon Systems, Inc (Newton, VIA) 800-TALK-TYP www.dragonsys.com Voice recognition systems, including Dragon Dictate and Dragon Power Secretary.

EyeTech Digital Systems (Mesa, AZ) 602-386-6303 www.eyetechds.com Quick Glance for eye-controlled computer cursor operation.

Madentec Ltd (Edmonton, Alberta, Canada) 800-661-8406, 403-450-8926 randym@madentec.com
Tracker single-lens sensing pointer device; Wireless Interface Sip and Puff (WISP) switching device.

Origin Instruments (Grand Prairie, TX) 972-606-8740 www.orin.com 3-D tracking systems (DynaSight; active target adapter); HeadMouse pointing system; SofType on-screen keyboard;

Dragger point-and-click emulation software,

Prentke Romich (Wooster, OH) www,prentrom.com Communication and computer access equipment.

RJ Cooper & Associates - (Dana Point, CA) 800-RJCooper, 714-661-6904 www.rjcooper.com Switch-adapted mouse devices including SAM-trackball and SAM-joystick.

TASH International (Ajax, Ontario, Canada) 800-463-5685, 905-686-4129 www.tashint.com Alternative keyboard and mouse controls; switches and accessories, mounting systems

Zygo Industries, Inc (Portland, OR) 800-234-6006, 503-684-6006 www.zygo-usa.com Augmentative communication systems, computer access and other assistive technologies.