

Computers and Persons with Disabilities

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INTRODUCTION

Computers could be regarded as the twentieth century discovery which had the greatest impact on the largest numbers of enterprises, businesses, households, and individual persons world wide. Only a small minority of the world's people could be regarded as remaining untouched by the influence of computers. In many ways computers made the world more accessible for large numbers of persons with disabilities enriching their lives. It has been estimated that 10% of the American population are living with one or other disablement and that computers should be accessible to them in order to enable them to live their lives as fully as possible within the limitations caused by various types of disabilities (http://www.trace.wisc.edu/docs/accessible_library/library.htm). This article will attempt to provide an overview of ways in which blind, deaf, paralysed and mentally challenged persons can benefit from using computers.

THE USE OF COMPUTERS BY PERSONS WITH DISABILITIES

Using computers could pose numerous challenges to persons with disabilities. Such challenges can arise during the "input" phase if these persons are unable to use the standard keyboard or mouse because they lack sufficient hand and/or finger control to execute the required movements. During the "output"

phase of computer utilisation persons could encounter problems in reading messages on the computer screen due to limited eyesight or in responding appropriately to "cues" which they might not hear due to impaired hearing abilities. Some paralysed persons could encounter problems in reaching a computer screen within the desired distance or height from their wheelchairs. This problem is aggravated for bed-ridden or quadriplegic persons. Such disabled persons might encounter problems in saving processed data or any documents, to print data or to retrieve previously stored data. In many cases, special ways can be found to address some of these problems.

Blind persons

It is a well-known fact that bats fly at night without bumping into objects by utilising sonar systems. During 1994 this principle was applied in developing sonar glasses providing feedback to blind persons about their environment - a clear



sound means the blind person is close to an object and a dull sound that the object is far away from the person. Large numbers of blind persons tested these sonar glasses and 80% reported that they could negotiate their environments more easily with the assistance of these sonar glasses which could also assist them to reach their computers more easily (<http://www.rjcooper.com/sonar-vision/index.html>).

Braille keyboards are available for blind persons enabling them to type their own documents. Although they remain very expensive compared to ordinary printers, braille printers are available enabling blind people to print and to proofread their own documents. It is possible to link two printers to one computer enabling blind people to print their documents on braille printers, proofread and correct them. Computer programs are available which can change braille letters into ordinary alphabet letters which can be then be used to print the final document on an ordinary printer without leaving the computer. This enables many blind people to act more independently than would have been the case without computers.

Persons with impaired sight can use specialised screens which magnify everything up to 100%. Some of these screens also reduce the amount of reflection facilitating the reading of messages. By merely using large type fonts (of 20 in stead of the usual 10 or 12) a number of elderly persons, who experience problems when reading due to the restricted accommodation of the eyes, can succeed in reading their computer screens without any expensive computer programs. Another aid for visually impaired persons is the utilisation of sound cues in stead of lights to indicate that certain "toggle keys" (such as "num lock" or "caps lock") are switched on (<http://www.rjcooper.com/sonar-vision/index.html>).

Other computer assisted aids available to visually impaired persons include "screen readers" which can

read the text (including graphics and dialogue windows) enabling blind persons to hear what the computer screen portrays. "Text readers" read only the text such as e-mail messages and word processing documents. Computer soft ware is available which can switch lights, radios, and other domestic appliances on and off at specific preset times enabling blind persons to manage their environments more independently (<http://www.rjcooper.com/sonar-vision/index.html>).

Deaf persons

A number of aids facilitate deaf persons' functioning and their accessibility to computers as well as their functions. The soft ware known as "talking screens by Words+" enable dumb or illiterate persons to communicate with the use of pictures. As deaf persons are unable to heed computer sounds such as beeps, soft ware is available which will print the sounds (such BEEP) in big letters on the screen so that deaf persons can take appropriate actions.

Paralysed persons

It is possible to control computer functions through nervous impulses from the human body by using sophisticated soft ware but this aspect requires further research to make its use more feasible. The paralysed person requires an electrode attached to a fully functioning muscle which can be used to send impulses to the computer. Sophisticated soft ware, known as the "biomouse" is required to send and receive such signals (<http://www.sciam.com/1096lusted.html>). Another biological approach entails the control of computers through eye signals. This technology relies on the corneal-retinal-electrical potential of the human eye. The retina, in comparison with the cornea, radiates a weak negative charge functioning in a manner similar to that of a very weak electrical battery. Electronic circuits can pick up the differences in the electrical charges

which arise in a person's face when their eyes move. Such differences in circuits can be canalised to activate certain computer functions (<http://www.sciam.com/1096lusted.html>). Although researchers need to solve many problems and address numerous challenges in order to improve biological control over computers, it is already possible for severely handicapped persons to select choices from an computer menu. This possibility has already expanded to the utilisation of a keyboard on a computer screen which can be controlled by means of eye movements. This possibility enables quadriplegic persons to type on a computer screen by means of using their eye muscles. Quadriplegic persons who can control their mouth muscles can use a stick to type on ordinary computer keyboards provided these have been set to be extremely sensitive to touch. "Sticky keys" can help paralysed persons or those who can only use one hand or only some fingers to type more effectively when required to use two or more keys simultaneously such as typing in upper case (capital letters) or when the "shift", "alt" or "control" keys need to remain depressed while typing other characters. So-called "delay until repeat" keys prevent the repeated typing of one key in case the depressed key is not released sufficiently quickly. Miniature keyboards are also available for persons with limited muscular activity. Specific computer soft ware is available which can replace the functions normally performed by the mouse by using specific keys on the ordinary keyboard, or combinations of keys. Another invention is a computer mouse which can be controlled by a person's foot in case the hand and/or finger functions are impaired. A "touch pad" enables a physically disabled person to move the cursors by means of touching the surface of the "touch pad" using a finger, or stick or pointer from the mouth, in the desired direction (<http://www.sciam.com/1096lusted.html>).

Soft ware packages are available which enable the keyboard to ignore the repetitive simultaneous bumping of two or more keys, facilitating the typing process for persons with impaired hand functions. A "keyguard" basically consists of a plastic cover for the keyboard with a hole for each key. This simple aid enhances key control and thus the typing process for persons with impaired hand and/or finger or muscular functions. Adjustable tables and chairs are available to further facilitate the accessibility of computers for persons bound to wheel chairs (<http://www.sciam.com/1096lusted.html>).

"Teleworking" offers a mechanism whereby disabled persons can work from home by using computers linked to modern information and communication technology systems. This possibility enables disabled persons to work in their own homes, at their own pace and to earn money without daily struggles to get to and from work. This system also enables persons to continue working who become disabled while employed.

Persons who are mentally retarded/handicapped

Persons who are mentally retarded require much more time, opportunities, commitment, patience and perseverance than other persons to master basic skills such as reading, writing and basic arithmetic. These efforts require extreme patience and commitment and much time from their care givers, parents and teachers. Special soft ware programs are available which can assist persons who are mentally retarded to learn to recognise letters of the alphabet, to spell words and to do basic arithmetic. The huge advantage is that the computer cannot become impatient with the learner who can repeat the same exercise time and time again until it is mastered. Whereas a person could possibly assist a mentally challenged learner to repeat a simple program five times without becoming impatient,

the computer can do so 500 times or more. In this way computers can assist mentally challenged persons to learn to read and write and do basic arithmetic who might not have been able to do so with human assistance only. Furthermore, specialised computer programs can help mentally challenged persons to achieve higher levels of reading and writing and doing arithmetic than might have been possible without computers. Learning a foreign language by using specialised computer programs is accepted worldwide as a cheaper and faster way of learning any foreign language than by using conventional face-to-face methods only. A mentally challenged person who can master any second language by using computers, will enhance his/her skills considerably. Computer programs can be used to teach any person to type - including mentally challenged persons. Mastery of typing skills can enable mentally challenged persons to seek gainful employment by doing basic typing work on computers. Furthermore mentally challenged persons can also be taught to transfer data to specific computer programs, such as information from questionnaires into computer data analysis programs, provided the mentally challenged persons can work at their own speed. In these ways computer courses and programs and skills can assist mentally challenged persons to earn their livelihoods in their communities, or even in their homes. In this way computer technology can obviate the need to institutionalise large numbers of mentally challenged persons for the sake of teaching them basic skills. However, it must be emphasised that computer programs can assist mentally challenged persons to acquire or enhance their cognitive skills, but that people remain indispensable to master interpersonal skills. In spite of the availability of a large variety of computer programs, the mentally challenged person will always require the help and guidance of his/her

teachers, parents and significant other people (just like any other person) to master social skills and to fulfil his/her emotional and social needs (Sinason 1992:1)

Computers can also be beneficial to the care takers of mentally challenged persons. Such care takers can join Internet chat rooms, exchange ideas and improve their care giving skills (Flisher 1997). Access to the Internet can also help care takers to feel less isolated and to maintain contact with family and friends by e-mail correspondence even if their time is too limited to pay regular visits.

CONCLUSION

A variety of aids exist which make computer utilisation more accessible for large numbers of persons with a variety of disabilities. An Internet course, lasting three weeks, is available which makes computer facilities and information technology more accessible for disabled persons (http://lists.village.virginia.edu/lists_archive/Humanist/v08/0273.html)

Computer accessibility enables persons with disabilities to overcome many challenges as illustrated by the non-profit "Disabled Business Persons Association" which provides help and guidance to disabled persons all over the world from San Diego in America (<http://www.web-link.com/dba/dba.htm>). Access to the Internet enables many disabled persons to acquire information, to communicate with many other persons through e-mail or through Internet "chat rooms" and even to earn some income from home. The disadvantage of computer communication is that neither interpersonal communications nor relationships can be established nor maintained in this way (Levine & Baroudi 1993). Nevertheless, computer access enables many disabled persons to accomplish that would have been impossible without such assistance. Enabling disabled persons to work from home, or to type

independently with computer assistance, is no small feat. Computers can indeed assist disabled persons to become winners in spite of their limitations and to expand their horizons of potential accomplishments to limits unimaginable without access to computers.

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