INNOVATION, BRAILLE INFORMATION AND WORKPLACE DESIGN
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INTRODUCTION
Developments in our society create new problems for the handicapped. Especially for the blind, the gap between non-handicapped and handicapped could increase due to the following developments: New jobs and tasks in the field of technology and information involve higher demands and are often more and more specialized. Partly due to this and also due to economic problems, the high unemployment rates affect the situation of the handicapped more than others. Instead of normal jobs, work at home, including free-time allocation and recreation, will become more important.

Finally, preparation for new specialized jobs involves a strong emphasis on education and study by the handicapped person. The blind person's concern is to keep up his possibilities as well as he can by using Braille and other opportunities for communication and information handling.

GOALS
The main goal is to reduce or to prevent an enlargement of the gap which exists between opportunities for handicapped and non-handicapped persons. More specifically this will mean for the blind and visually impaired that:

- Aids have to be developed which adapt working situations so that they can be used by the blind, or which will give some compensation. The exchange of those task elements which cannot be handled by the blind and visually impaired with non-handicapped colleagues might be one example.
- More jobs and occupations have to be explored for handicapped persons. Much attention is focused on "typical" jobs for the blind, but especially in the field of information technology, new jobs/occupations are becoming available, and these should be carefully considered by the visually impaired person.
- Technological development has to be guided in a more "handicap-friendly" direction and/or alternatives and options in the uses for modern equipment have to be incorporated into this equipment.

ASPECTS OF THE PRESENT SITUATION
It is expected that office work will comprise more than 50% of jobs in the near future. Within these jobs there will be about 40-60% of tasks which deal with information handling activities. These activities include reading, writing, keyboard operation, computer file operations and many others. Due to the important role of the computer, the number of terminals will increase from one terminal for 25 people to 1:7 in the near future and, eventually, a ratio of 1:3 could be expected.

Besides the important role of keyboard/terminal activities in professional situations, the use of keyboards will also increase in hobby and daily tasks such as banking and...
shopping. A new information display technology, automatic speech production, could have an important impact for the visually impaired. However, at this moment, the quality is far from sufficient to use in a text reading machine situation. And for applications in computer tasks it is not yet very well understood how it should be used: Not enough human factor knowledge on this subject is available.

Also the tactile information transfer in the case of large Braille displays and full page graphic displays is not very well understood from the ergonomic viewpoint. Nevertheless it will be a great opportunity if such display systems become commercially available.

A very serious aspect in the evolution of computer technology from the viewpoint of the visual impaired person is that terminals are optimized in the direction of the use of visual information. This can be illustrated by the following examples:

- Touch panels/displays which are programmed as a display screen represented to control the execution of programs cannot be used in this way by the visually impaired.
- The same can be said of the "mouse"-control and, in general, all cursor control devices which are based on display screen oriented software menu's.
- Software is developed with a strong emphasis on the lay-out on the screen: the lay-out itself includes a lot of information. Examples are the "spread-sheet"-systems, vision software and menu-systems as used in the IBM-PC and the MacIntoch personal computer.
- Terminals of larger computer systems transfer the information from and to the computer by a video-signal. The consequence is that it is difficult to connect a parallel braille-system to the terminal.

These software and hardware developments are in favour of the sighted user. To change such a development will be impossible but more possibilities for less screen-oriented systems connected in parallel, have to be considered.

Finally, from a small survey project in the Netherlands on employment aspects of visually impaired persons it is seen that the blind employees in offices consider automatization as a threat to their position and not as a challenge providing new possibilities which could be explored by them.

**SOME CONSIDERATIONS ON WORKPLACE DESIGN**

**Physical/environmental aspects:** A large amount of literature is available on the physical aspects of workplace design for non-handicapped office workers. This literature deals with illumination, temperature, environmental noise, seating, arrangement of office furniture, administrative equipment, etc. Almost no literature is available about these aspects dealing with the special influence on a handicapped person. For the blind office employee it is necessary to draw attention to:

- **Seating and posture in relation to desk-height.** An essential difference with the non-handicapped person is the reading process. Braille reading requires enough flat space on a table and a height of the table which is comfortable for a good hand position for the tactile reading process. A recommendation is to have as a table height a reading surface which is about 5cm