

# The Importance of Information Technology for Visually Impaired Children and Youngsters and the Expectations for Future Development

By

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## Introduction

Having been involved as an independent consultant in research, development and consulting activities on visual impairment, enabling technologies and accessibility issues for the past decade and a half, the author discusses the importance of information technology, IT literacy and information access for visually impaired children and youth. The discussions focus not only on information technology as an enabling technology to be deployed by disabled users. Additionally, it discusses the importance of general-purpose IT skills for everyone who wishes to play an active role in the information society.

As an advisor to a range of national and international companies, organisations and agencies, the author has maintained close links with Refsnæsskolen in Denmark. Refsnæsskolen is the Institute for blind and partially sighted children and youth in Denmark and has national responsibility. The visions, opinions and positions discussed in this paper are the sole responsibility of the author. However, Refsnæsskolen and the visions presented by the institution have been significant sources of inspirations.

Although the cases discussed in this paper are Danish, most have a global perspective; hence,

the conclusions are equally valid in most other countries.

## The Basic Assumption

Integration. Independence. Participation. These are three key words in the Danish vision for visually impaired children and youngsters. A visually impaired person is merely a person who cannot see properly. However unfortunate the case may be, a visually impaired person has the same rights and opportunities, as well as the same obligations, as everyone else in society.

Integration throughout the educational system and on the job market. Independence in the meaning of self-sufficiency – without the need for personal assistance and centralised support organisations. And the ability to participate actively in all aspects of society.

## The Importance of Information Technology

Is information technology, computer literacy and access to information important in today's society? Looking at the facts and figures, the question is rhetorical beyond doubt:

The Danish population is approx. 5.3m with a total of 2.9m households [1]. According to 1999 figures published by the Danish Ministry of Re-

search, some 1.7m people use the Internet regularly and an estimated 1.4m households have a PC. 77 per cent of all companies with more than 20 staff have Internet access and all (99 per cent plus) use computers and networks extensively [2]. A recent survey of Internet usage showed that 95 percent of all university graduates use the Internet [3].

Denmark is, along many other developed countries, transforming into an information society where value is based on the ability to use, share and create knowledge and information as well as on other intangibles [4].

Obviously, the success in the information society demands computer literacy. It is more or less impossible to complete an education let alone get and maintain a position on the job market without IT skills. Likewise, the ability to utilise information technology is important in most other aspects of life. Consider email for correspondence, home-banking, access to public services, access to library services, e-commerce, access to traffic information, the ability to book theatre tickers – just to name a few examples.

As such, information technology, computer literacy and information access is important to everyone in information society, the visually impaired not excluded. In fact, these competencies may be even more important to people with a visual disability, as discussed in more detail in subsequent sections. To some extent, IT competencies may eventually resolve some of the issues of under-employment and unemployment amongst the visually disabled.

### **Information Technology is a Double-Edged Sword**

Information technology offers a range of possibilities to the blind and partially sighted: The computer can be used as an intelligent interface between the visually impaired and the sighted;

information that would otherwise be inaccessible or require manual processing to become accessible can be automatically transformed into formats better suited for the visually impaired; as technologies emerge and mature, technologies that were used solely as enabling technologies in the past are becoming mainstream, thus affecting price as well as quality; and finally, the ability to establish a virtual framework through the use computers, geography and physical location matters less, hence increasing the opportunities in terms of employment and education.

At the same time, however, information technology and the ways in which the technology is deployed represent an equal range of challenges. Although the Internet – in theory – makes information available to anyone who can use a computer, poor web-design raises new barriers. Furthermore, the short learning curve combined with relatively inexpensive solutions based on speech synthesis may further erode basic skills such as Braille literacy.

### **The Opportunities**

That the computer can be used as an intelligent interface between the visually impaired and the sighted is not new. For years, visually impaired have been able to command the user interfaces of computers using screen readers, speech synthesis, Braille displays and screen magnification systems. Furthermore, the visually impaired have access the vast majority of all business applications, personal productivity tools, office applications, email systems and web-browsers. Using enabling technologies in combination with general-purpose computer systems, the blind and partially sighted have been able to transform information from formats aimed at the sighted into formats more suitable to meet the needs of the visually impaired. Enabling technologies for such automatic transformation include Braille translation systems, screen magnification systems and text-to-speech engines [5].

## **The Danish Concept for Blind Children**

In Denmark, a comprehensive concept for blind children has been defined and created by Refsnæsskolen. The concept is based on the LogText, and 8-dot Braille computer that can be used both as a stand-alone system for reading, writing and note taking, and as a control device for a personal computer. For years, Refsnæsskolen has produced and distributed electronic Braille books to be read on the LogText.

Key additions to the LogText are the WinLog "Screen Reader" and the Sensus Braille translation system. Although it provides functionality comparable with other screen readers, WinLog is not really a screen reader as it does not read the visual display. Rather, WinLog is a Windows communications programme that provides the blind with an alternative blind-friendly interface to Windows. As such, WinLog is based on a non-visual concept of Windows and provides logical and linear navigation and orientation capabilities.

Sensus Braille is a two-way, multilingual Braille translation system capable of translation to and from contracted Braille in both 6-dot and 8-dot Braille format. Currently, modules have been developed for Danish, English and Swedish. However, as the system is modular, new languages can be added with minimum efforts.

The Danish concept for blind children did not, however, invent itself. It is the result of strong and visionary leadership and dedication from the management at Refsnæsskolen as well as significant investments in terms of time financial resources, and the recruitment and continued support of a product development team.

## **Information is Available**

In the mid-1980's, the capture of information was one of the key challenges in making information available in Braille and other suitable formats. Word-processing and desktop publishing were not used as widely as is the case today. Conse-

quently, most information was available only in print only. The solution to this problem turned out to be scanning, OCR processing and – simply – manually retyping and storing the printed text on a computer.

Today, the situation has changed dramatically. All information is produced electronically and is – at least in theory – available directly from the publisher. A number of issues still remain, especially in the areas of copyright and copy protection. In addition to information published in print, vast amounts of information are available directly on the Internet and on CD ROM and DVD. Finally, electronic books (or eBooks) are emerging in the mainstream market. A recent survey estimated that by 2005, electronic books will account for as much as 10 per cent of the total American market for published books [6].

## **Enabling Technologies are Becoming Mainstream**

Although enabling technologies developed especially for people with special needs represent powerful tools, these enabling technologies are typically developed using proprietary technology. Their limited markets result in relatively high prices while at the same time demonstrating rather low quality. The manufactures cannot be held to blame for this. The high price/low quality relation is simply a reflection of the market conditions.

However, in recent years many technologies that used to be utilised more or less exclusively as enabling technologies are being adopted by the mainstream market. The result could well be high-quality, low-price products based on industry and/or de-jura standards.

An example of a technology that is being adopted by the mainstream market is speech synthesis/voice recognition. As talking computers, voice controlled computer interfaces and voice-response systems become the norm, the quality

of speech synthesis and voice recognition will improve while the prices of these technologies will drop.

Likewise, as more and more people begin to use portable, hand-held computers such as Palmtop computers and WAP-based mobile telephones to access information on the Internet and elsewhere, current restrictions on bandwidth, navigation and accessibility will be lifted. The hand-held computers have many of the same characteristics as we know from enabling technologies including limited displays, poor resolution, limited power supply and slow network connection. Whereas the information providers may be able to get away with not providing access to people with special needs on their Internet sites, the general public and – especially – the business community will not accept these limitations.

Finally, a word on electronic books. As mentioned earlier, the main problems relating to having access to electronic versions of printed material are copyright and copy protection issues. As electronic books become an integral part of any publishing activity in the mainstream market, these issues are bound to be resolved. Once available as an electronic book within a framework that protects the rights of authors and publishers, little needs to be done to ensure that the books can be rendered in formats suitable for the blind and partially sighted.

### **Mobility matters less**

High unemployment figures and under-utilisation of the skills and abilities of the visually impaired are well known problems. Information technology may not be the sole answer to these problems. However, IT can play a major role in terms of improving the conditions.

Tele-commuting and home-working are becoming accepted by most employers, either as a permanent solution with virtual teams of co-workers, or as an alternative to going into the

workplace every day, five days a week. At the same time, on the organisational and business side of the equation, a number of trends are fueling this practice: A looser connection to any single employer, an increase in the number of freelance workers or self-employed consultants, outsourcing of non-core areas, creation of call centres, customer support centres, etc., are examples of this development.

That it is unnecessary to be present in a physical location to perform a job addresses practical issues of mobility. Similarly, it may address psychological problems that organisations may have in terms of employing disabled staff. The solution may not ideal in that sense, and home-working may have significant negative side-effects in terms of isolation and segregation. However, more disabled people may get the opportunity to work in ways that match skills, education, abilities and personal interests.

Another aspect relates to training. Distance training is becoming a significant source of revenue for many educational institutions and a growing number of courses are being offered via the Internet. The fact that students can receive course material, interact with teachers and instructors, and submit assignments over the Internet without being physically present is appealing to many. Having access to the Internet will broaden the range of educational opportunities for the blind and visually impaired.

### **Threats for the Future**

Over the past decade we have resolved a large number of issues relating to information technology and access to information. However, as some problems get resolved other materialise. In the remaining part of the paper, two of the most important issues are discussed: Inaccessible web-design and the decline of Braille literacy.

## Inaccessible Web Design

“The power of the Web is in its universality. Access by everyone regardless of disability is an essential aspect.” The statement has been made by Tim Berners-Lee, the inventor of the World Wide Web and currently the director of the World Wide Web Consortium.

Within this context it can be argued that accessibility is really a matter of providing as many people in as many different situations and from as many different browser platforms with access to web-based information. It should not matter whether the user is disabled, whether (s)he browses using a mobile telephone in a car without the ability to use hands and eyes, or whether (s)he uses a non-mainstream platform such as a Palmtop computer when accessing the Internet.

Yet the fact is that the web is not accessible. Studies in Denmark document that it is the rule rather than the exception that a web site is inaccessible with no improvement year-on-year [7]. And public web sites are just as bad as private web sites. The area is well documented with multiple guidelines and recommendations [8] and few - if any - reasons exist why web sites should not be accessible.

On a slightly more positive note, it would appear as if there is a growing interest to address the issues of inaccessible web sites. Especially public institutions are under pressure to improve their sites, at least from a point of view of political correctness. The solution may, however, come from a different angle:

As mentioned earlier, portable hand-held computers such as Palmtop computers and WAP-based mobile telephones share many of the characteristics of enabling technologies. Web-sites that are inaccessible or difficult to use by disabled users will be similarly inaccessible and/or difficult to use by mainstream users.

## Erosion of Basic Skills

Over the past 30 years, Braille literacy has shown a dramatic decline. In America [9] and the UK [10], alarming statistics have been published and although less significant, similar trends are reported from other countries (e.g., [11]).

Many people fail to recognise the importance of Braille: It is difficult to learn as a visually impaired person, difficult to read and understand as a sighted person, it is costly and time-consuming to produce and Braille devices such as Braille printers and Braille displays are expensive. In many cases, speech synthesis appears to be an attractive alternative.

However, a symbolic written medium is as important for the blind as it is for the sighted. Braille is a fundamental means of communicating and plays a significant role in the process of intellectual development: It is so much more effective to be an active reader than a passive listener. Furthermore, Braille literacy is an integral part of the personal identity for disabled people [10]. In general, lack of Braille skills equals illiteracy – a rather serious issue in the information society.

In Denmark, much time and efforts are being spent on Braille and Braille literacy. Despite a growing resistance towards the importance of Braille literacy, especially amongst sighted and the late blind, Braille is a key part of the concept for blind children and youth at Refsnæsskolen. The Braille codes (6- and 8-dot) and contraction policies are being continuously refined, as are the Braille translation tools. Finally, Refsnæsskolen continues to promote Braille literacy and the use of Braille as the primary medium for the blind.

Would it not be sad if we finally managed to resolve the problems of inaccessible information only to find that our target audience – the blind – is no longer capable of reading?

## Summary

General IT literacy and access to information are critical if visually impaired children and youth are to have a chance in the information society.

The technologies represent tremendous opportunities as an intelligent interface between the blind and the sighted, thus facilitating integration, self-sufficiency and active participation.

Emerging mainstream technologies such as speech synthesis, voice recognition, mobile computing and electronic books will lower the prices and increase the quality of enabling technologies.

However, a number of issues remain outstanding especially in terms of web accessibility and Braille literacy.

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