A USABLE WEB FOR LONG-STAY HOSPITALISED CHILDREN

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ABSTRACT

This paper analyses the problems that should be considered when designing a web site for disadvantaged children. We focus our research on long-stay hospitalised children who use the Internet to communicate with realities located outside their usual surroundings, especially with distance education related activities. We introduce a case study which focuses on the use of the Internet in some Italian hospitals and then we sketch out some guidelines for designing usable web sites for hospitalised children.

Keywords

Usability, disadvantaged children, distance education.

1. INTRODUCTION

The use of telecommunication and computer technology to support the education of hospitalised children is promising, but it requires the support of appropriately designed interfaces.

Some previous research in the field of web usability [4, 9, 10] focused on the analysis of interactive interfaces; the aim was to identify general principles to be used and applied in specific contexts. However, these approaches were not specifically focused on psychological aspects. In particular, aspects relating to personality, perception, cognitive stress and attention are important in the context of research centred on virtual environments.

Our research aims to contribute to these issues by analysing the ways in which hospitalised children use the Internet and by identifying usability guidelines related to web interfaces for a learning environment.

1.1 How hospitalised children use the web

Hospitalised children cope with disadvantages that can lead to psychological, physical, and technological impairments.

Communication technologies are very important because they can prevent children from feeling as if they are living alone and isolated - they provide a way to keep in contact with the external world, with their parents and friends, with the school system.

In a previous research [11] Mueller pointed out that hospitalised children enjoyed writing e-mails, because in that way they could communicate without revealing their disabilities.

In fact, the Web creates a new social environment in which disadvantaged children can feel adequate, as they are not stigmatised by their disabilities. As a consequence, they feel free to express themselves.

We believe that the same mechanism could be exploited in the educational process to improve children's skills. For instance, by interacting with the Internet, children can improve their creative or writing ability, hone their grammatical or painting skills, resulting in self-enhancement. Moreover, a disabled child can access information worldwide located across the Web.

1.2 Case study

The present research was conducted with long-stay children in several hospitals in Milan. The subjects of our research had been in hospital for at least two months. They were all located in the paediatric oncology and orthopaedic units of the hospitals. During the research, we recorded how long children spent on the Internet and for what purposes.

Of the 408 children who were potential subjects, 229 used a computer. The computer-using children were surveyed using a structured questionnaire.

If we analyse the data according to age group, the results show that:

Children aged between 7 and 11 (118) mainly used the computer for:

- ?? playing, with the help of their parents or of the hospital staff (69% of the subjects);
- ?? simple educational searches (31% of the subjects).

On average these children spent 37 minutes per day on the computer:

- ?? 6 minutes, in order to find school material;
- ?? 31 minutes, for other purposes.

Children aged between 12 and 15 (111) mainly used the computer for:

- ?? complex games without the support of the parents or the hospital staff (41% of the subjects); amongst this sample, 67% interacted with people met on the Internet (for example, to play backgammon);
- ?? simple educational searches (59% of the subjects).

On average these children spent 85 minutes per day on the computer:

- ?? 20 minutes, in order to find school material;
- ?? 65 minutes, for other purposes.

The results of the survey confirmed that the use of computers in the hospital allows children to maintain the perception of a high level of self-efficiency, whether the interaction takes place for game purposes (in order to stimulate creativity, Erikson [6]) or for performing simple tasks (thus stimulating the development of cognitive functions, Piaget [13]).

The results obtained in the context of self-efficiency are related to variable scholastic ability and also confirm that the children using computers had good levels of self-esteem.

We have observed a correlation between increasing age and a higher level of personal optimism. Additionally, the more the level of self-esteem increases, the more the level of self-efficiency seems to remain constant. Among all the test groups, a strong facility for self-recovery seems to be correlated with a high self-efficiency level.

2. GUIDELINES

The potential of computers to help disadvantaged children should be enhanced by the careful design of the resources they can access.

In fact, there are many barriers that inhibit the use of these technologies, mainly due to interfaces that are not designed to be accessible to everyone.

In the following sections we discuss some usability issues that should improve accessibility for hospitalised children.

2.1 Designing the web page

2.1.1 Layout

When designing a web page, developers should consider the text width and design for shorter lines (about eleven words) as opposed to longer ones. Longer lines require greater lateral eye movements [12] and make reading more tiring [8].

In this regard, Gregory and Pouton [7] stated that people with poor reading ability performed better when the line length was shorter (seven words). Hence children, especially if they have some disabilities, or if they are tired or under certain medical regimes, would prefer reading short lines.

Additionally, the page should be linear (content organized from left to right and from top to bottom); the navigation of a non-linear page can be difficult for users with input or output devices different from standard keyboard, mouse and monitor.

2.1.2 Fonts

Recent usability studies [1] analysed preferences for font face and size amongst younger users.

14-point fonts were considered to be easier and quicker to read; in terms of the typeface, children showed a preference for Comic and Arial.

Other usability research [16] reports that the average user perceives sans serif fonts as being easier to read and also, more attractive.

2.1.3 Colours

An appropriate combination of colours with high contrast between background and foreground are fundamental requirements.

Scharff and Hill [14] indicate that a white background facilitates understanding of the information written on it: the most readable colour combination appears to be black text on a white background followed by various other combinations based on dark text with a lighter background.

It is also necessary to remember that there are many children with colour deficient vision. For these children it is impossible to read information encoded with particular colour combinations, such as red and green or blue and yellow.

2.1.4 Use of animation

Children are attracted by animations [2]: colourful animated pages or images usually attract children's attention.

However, it is best to avoid animations offering no interactivity, i.e. with no opportunity for input from the user; this applies both to continually repeating animations (since they annoy the viewer) and to animations that only cycle once, since these types of animation can be confusing.

On the other hand, animations inviting user input are useful, especially in the case of hospitalised children, because they are often tired or under medication, thus resulting in a reduced threshold of attention.

2.2 Use of appropriate language

Text directed at children requires particular attention to language.

At least two aspects need to be considered: first of all, it is necessary to write in a way that is suitable for the primary users (the children); secondly, it is important to write for the children's "tutors", both human (medical staff, family) and, perhaps, even non-human (for example, filtering software).

The sensitivities of the children should be born in mind - terms such as disease, tumour, or leukaemia, are probably best avoided. Some sick children could have possible depression exacerbated by insensitive content. It is then, fundamental, not to mix up content suitable for adults or for medical staff with content oriented towards hospitalised children.

The language should also be syntactically correct. In fact a person who reads a page using a speech synthesizer may not be able to understand text because of just one word with a spelling error (for example). This is especially true when we consider children, who are less accustomed to infer from the context.

2.3 Support multiple methods for access

Disadvantaged children can suffer problems in accessing web sites which require the execution of complex technical tasks or that do not provide redundant communication channels.

Many experiments which focus on disabled users report common performance errors, such as: pressing keys meanwhile holding down other keys [3]; hand tremor that makes impossible to strike keys without hitting adjacent ones [5]; typing and pointing errors [15].

A hospitalised child usually makes intensive use of a personal computer and the Internet in different contexts and under different conditions, and should always be able to use a system without effort.

Different input/output devices are available to help disabled users with web browsing:

- ?? screen readers;
- ?? voice recognition software;
- ?? screen magnifiers;
- ?? alternative keyboards;
- ?? on-screen keyboards as input.

This technological support can only help disadvantaged users when the underlying architecture and coding of the web site are well designed and implemented.

Designers should avoid the use of links without interstitial text (links not separated by text or blank spaces) and the insertion of elements that require mixed mouse and keyboard sequences, such as multiple select input elements in forms. Because pointing can be less precise, users may need larger targets or increased spacing between targets.

Within the HTML code, it is suggested that a label is present for every form element - this allows users to "press" a button by clicking on the button itself or above and around the related text. For a similar purpose, it is important to provide the user with index information for links, to order correctly, page links accessed with the tabulation key.

Another technique to help disadvantaged users (but also non-disadvantaged users) suggests the provision of redundant communication channels, perhaps by supplying both auditory and visual feedback.

As an example, to communicate an error message, it is not useful to rely on colour only; it would be more usable to provide sound, visual and textual messages. As a further example, when using images as well as movies or audio objects, it is good practice to furnish every image or object with an alternative textual description.

Providing equivalent information to visual, auditory and textual content is, incidently, probably the best way to make the page accessible to *everyone*.

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