

The Vickie Project

Visually Impaired Children Kit for Inclusive Education

Dominique Archambault^{1,2} and Dominique Burger²

¹ INSERM U483 / INOVA, Université Pierre et Marie Curie
9, quai Saint Bernard, 75 252 Paris cedex 05, France

² Laboratoire d'Informatique du Havre, Université du Havre
BP 540, 76 058 Le Havre, France

Dominique.Archambault@snv.jussieu.fr

<http://inova.snv.jussieu.fr/vickie>

Abstract. This paper provides a general introduction to the Vickie Project, aimed at facilitating the inclusion of visually impaired pupils and students. An unified user interface will allow the pupils and students to access documents with specific devices, and a synchronised graphical display will supply sighted teachers with a view of the same document. A set of tools will allow compatibility with existing school contents and services. This paper describes the general orientations inferred from a users' needs study.

The social and cultural inclusion of handicapped persons is one strong objective of European social policies. Inclusion in school and universities is therefore an essential step in this direction. In some countries, like Italy and Sweden for instance, the integration of handicapped students in mainstream education has been a general rule for many years. In other countries, like France, there is a trend to encourage this movement in developing intermediate structures in which young children are prepared to join ordinary schools (the French "*Handiscol*" program[1] for instance). In the future, these orientations should characterise most of educational policies over European countries.

Vickie's main commitment is to provide a technological environment facilitating the inclusion of a visually impaired student in the mainstream education.

Vickie is a R&D project funded by the European Commission, on the Information Society Technologies Programme, including research organisations, industrial companies and user organisations from three countries: France, Ireland and Italy. The Vickie Consortium includes: *Inserm U483 INOVA*, *Université Pierre et Marie Curie* (France), co-ordinator, *Association BrailleNet* (France), *Regina Margherita National Library for the Blind in Monza* (Italy), *Centro di Ricerca, Sviluppo e Studi Superiori in Sardegna* (Italy), *Daumas Informatique* (France) and *St-Joseph's School for the Visually Impaired* (Ireland).

In this paper we will introduce the objectives of the Vickie project. Then the users' needs study will be summarised. Finally the general orientations for the software developments, which were extracted from the resulting data of this study will be presented.

1 Objectives of the Vickie Project

1.1 To Help Visually Impaired Children into the Digital Age

Visually Impaired Persons have to master new technological tools to be capable of playing fully their role in the Information Society. Therefore early training in computer activities has to be set up from primary schools and during all the educational process. For instance, Vickie will provide simple services allowing children to communicate by electronic mail with other children, family members, teachers...

Vickie will work out new concepts for the progressive learning of standard computer systems. This includes strategies making possible for children or beginners to smoothly approach the access technologies. This involves the identification of users' profiles and the development of personalisation tools.

1.2 More Accessible Learning Documents

In the information society, most of the learning materials are produced in a digital form from their origin. Moreover, the generalisation of standard and structured electronic formats constitute a suitable basis for the production of document files for non visual presentations. These files can be read on a Braille display, by means of a speech synthesiser, on a computer screen, printed with the suitable size font, or embossed on a Braille printer.

Vickie will develop a set of tools and an environment making possible a better co-operation between various professional ranging from publishers to transcription/adaptation specialists. Vickie adaptation tools will make possible to create an adapted document from the electronic source focusing only on the part that has to be redesigned for the special needs of the visually handicapped (images, graphs, tables...). The integrity of original documents will be maintained and their trace will be monitored precisely throughout the adaptation process. This will contribute to lower one of the major barrier currently encountered by schools and transcription centres in getting authorisations from publishing companies.

A standard structured format will be used. It will suit the great variety of documents that students have to access at school/university: course material, books, notebooks, administrative information, Web pages. This format will be based on XML and will allow to produce different output formats according to the use (for instance printed Braille, or VoiceXML, or HTML that can be read by a textual browser — respecting the WAI accessibility recommendations).

1.3 To Make Transparent the Written Communication

Written communication is central throughout education. An argument for the creation of special education was that the blind use a different system for reading/writing. In fact, Braille is a special font and a set of rules for abbreviating words. Thus, technology can make this difference totally transparent thanks to well designed interfaces and personalisation tools. As Vickie will propose a

unique format and a standard interface, it will be very simple for visually impaired students to create documents that sighted teachers can read, and to read the corrections made by teachers. Also, students will have facilities to communicate with their peers. The editing tools will be used for the creation of accessible material. Sighted teachers will easily create documents that can be printed or read indifferently on a screen, a tactile or audio device.

1.4 Co-operation between Teachers

The inclusion of handicapped children in ordinary school means that a part of the experience that teachers of special schools had may be lost. The development of technological networks opens new ways for sharing and reinforcing expertise among professional actors. For instance, teachers can take part in discussion groups, in net meeting, or follow long distance training. Vickie will explore this direction with the objective that teachers having a specific experience may assist colleagues and improve the common experience. The accessible interface of Vickie will make possible sighted teachers to receive/bring assistance from/to their visually impaired colleagues. For instance, a teachers would not have to be an expert in Braille, provided he/she could benefit from the experience of others. Vickie will also provide a software architecture and a unique service interface in order to encourage exchanges in software teaching tools among the teaching community. This architecture will be open as to allow the upgrading of services through the Vickie network. New services will be easily added, as well.

1.5 Multi-linguality and Cross-Culturality

Vickie will take into account the multi-cultural aspect of the project. Particularly the different policies in the different countries will create suitable condition for designing several models of teaching networks. The project will put an emphasis on the exchanges between schools among the three countries concerned. The evaluation methodology will be discussed in full detailed among the partners concerned with education in the different countries and the results will be shared, as well.

1.6 Effective Diffusion

The approach to effective diffusion is to produce a pre-industrial prototype that will be proposed to schools, training centres and companies employing visually impaired persons as soon as the project is finished. Tests carried out in schools will put an emphasis on usability by naïve users in order to reach a user-friendly product at the end of the project.

2 Users' Needs Study

The users' needs study is split into 2 parts. A first part, during 6 months, was planned to produce a report based on analysis of existing systems and on the

experience and requirements of end-users. This report is the basis of software developments. Then the users' needs study will continue during the 12 next months in order to produce a final Users' Needs Report. This study cannot be considered as an end-point. It would not be realistic to pretend that all the features of the future Vickie system can be thoroughly described from these inputs only. Rather, this study proposes directions for designing the Vickie system and defining its functionality. Finally the development process follows an iterative development paradigm involving permanent interaction with end-users so that technical decision can be updated during the project.

The study was conducted by *Biblioteca Regina Margherita* which has been playing a pioneering role in supporting the integration of visually handicapped children in Italy for nearly 30 years. *Biblioteca Regina Margherita* co-ordinates a network of 13 resource centres in Italy. In France it was run by the *BrailleNet Association*, which involves many schools and resource centres as well as associations of/for the visually impaired persons. In Ireland it was run by *Saint Joseph's School for the visually impaired*, which acts as a national supports centre for integration and as the National Braille Production Centre.

2.1 Three Types of Users

The users' needs focuses on three types of users. The first type concerns visually impaired students and pupils (*VISP*), from various ages and with various levels of visual impairment. The study describes the features that are requested to allow them to be integrated in an inclusive classroom, to work using their particular display, during the main activities that happen in a classroom. It includes all the documents that they need to access, like school books, dictionaries and documents provided by teacher, etc. The second type of users are teachers. The study describes the features enabling the teacher to access to the work of the *VISPs* and to give them feedback, the tools that they should access in order to prepare documents in an accessible way. The third type of users are professionals who transcribe school books for the blind. The study deals with the tools they need to prepare documents for the Vickie system and tools that facilitate the distribution and the storage of documents, and the co-ordination of work.

2.2 Methodology

This study took into consideration different sources of information:

- *The analysis of existing systems*
 - specific software existing in Italy: *Erica*[2] and *Omnibook*[3];
 - the use of computer in several special schools in France;
 - the tools developed in several transcription centres in France;
 - a review of existing school mainstream portals and electronic contents.
- *The experience and requirements of end-users*
Two questionnaires were prepared (one for teachers, one for students) in order to identify:

- the current use of technology among students and teachers;
 - what technology is commonly used for in the educational setting;
 - successes and failures of current technology;
 - expectations concerning the proposed Vickie system.
- *Technical recommendations* elaborated by *Biblioteca Regina Margherita* on the basis of their experience
 - *Legal definitions* of visual impairment in the different countries.
 - *Three “Use Cases”* — corresponding to the three types of users defined previously. They describe concrete situations where the Vickie environment should provide solutions to identified problems.

3 General Orientations

From the analysis of these data, general orientations for the software developments were extracted. These orientations concerns the user interface, the services that should be provided, the software architecture, but also a few features like secure access to data.

3.1 A Document Oriented Metaphor

The aim of the metaphor is to allow the teacher to communicate with the *VISP* in the same way he/she communicates with the sighted pupils. The interface should display objects that symbolise the physical objects that can be found on a physical pupil display: books, notebooks, dictionaries, a diary... Then it should be coherent with statements given by the teacher, like for instance: “open your book of math on page 25”, “open your English notebook” or “write in your diary the following exercise: ...”. It should also allow the *VISP* to deliver documents to the teacher, or the teacher to give the *VISP* a document he/she has prepared for all pupils.

A lot of specific features should be provided like for instances the possibility to copy a part of a document into another, the access to virtual libraries, with secure access to books with intellectual property right. For instance, it should also give access to the local school computer services (if any), as well as school portals and school contents that can be found on the Web.

3.2 Software Architecture

To allow these features, the software architecture should be modular and interoperable. It has been decided to use an architecture of services that can be accessed through a unified user interface (see section 3.3).

Each service is dedicated to a specific task which correspond to a specific kind of object. These objects often correspond to documents: book reader, dictionary, notebook... But it can also be a game or the desktop. In the case of documents, the architecture identifies the service that should be used to access a given document, then to launch it. The architecture manages all objects. At any time

only one object is displayed, but many can be opened and it is possible to switch between them, to close one or to open a new one.

The currently displayed object is processed by its corresponding service and the data that describes one reading unit is sent to the user interface. A reading unit refers to what should be displayed on the teachers display, for instance one page of a book or a notebook, one entry of the dictionary. The data exchange between services and user interface uses a specific XML-based format.

The software architecture is distributed: the services are published on a service portal and deployed from an application server. The particularity is that once a service has been deployed from the application server, it can be stored in a local cache to be used when the computer is disconnected (for instance at home if the pupil uses a laptop that he bring back home). In this case, a light version of the application server is launched locally. Obviously this concerns only the services which do not need access to network resources.

A full description of the software architecture is given in another paper in this volume[4].

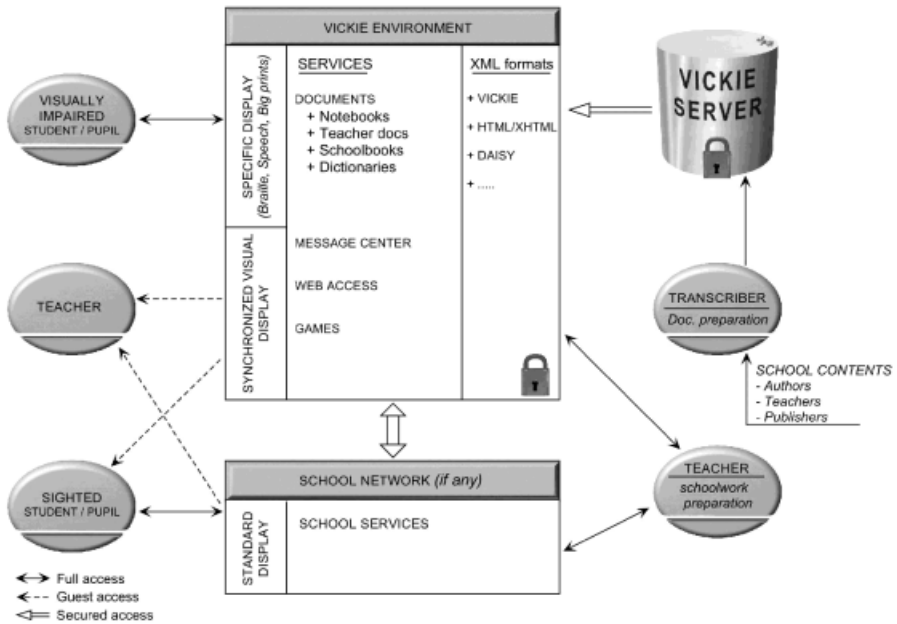


Fig. 1. The Vickie Environment

3.3 Dual Display User Interface

The user interface for *VISPs* in the Vickie environment should provide two synchronised displays: the first one is used by the *VISPs* and the other one allows sighted persons in the classroom to access to the *VISPs*'s work.

The *VISP* display is specific and allows all necessary settings to fit a user profile. Three different kind of output devices are considered:

- Braille displays
- speech synthesis
- screen for adapted visual display (size of the prints, colours of the foreground and the background, space between characters and/or lines...).

The visual display will allow to show the *VISP*'s desktop in the same way that the physical desktop of sighted pupils can be seen. It will display the content of the current document that is been read by the *VISP*, localising the part that is currently viewed on his specific display. In the case of partially sighted pupils, the best situation would be to have two physical screens but this can be simulated either by the possibility to switch between the 2 displays or to divide the screen in 2 parts.

The input devices will include standard devices as well as specific ones: standard keyboard; Braille keyboard; standard mouse; Braille cursor routing keys.

3.4 Compatibility and School Preparation

Compatibility with existing systems and formats is a very important issue. Several cases should be taken into account:

- internal school networks allowing to access to some services;
- existing electronic mainstream formats available for school contents or electronic books;
- existing electronic specific formats (like DAISY[5] for instance).

In the case of existing school network services, it is mandatory that these services respect some accessibility guidelines (in the case of Web-based systems for instance, the WAI[6] should be respected).

In the case of mainstream documents, specific adaptation is often necessary for some graphical or complex elements , like pictures, graphics and tables in a book of geography. These adaptations are usually developed by professional transcribers that work in resources centres or special schools. Vickie will provide tools allowing to annotate the contents with adapted contents and to coordinate the works of professionals.

The Vickie environment will also provide tools to be used by teachers for their work out of the classroom (school preparation or exercises assessment), and professionals that transcribe school contents. One very important concern is that users should be able to use the same tools they usually use. For instance if a teacher usually designs the documents he/she gives to pupils with a given word-processor, he/she should do the same if one of the pupils uses the Vickie environment. Then he/she should be supplied with tools that make the transcription into a document format that can be accessed by a Vickie service.

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More information about the Vickie project can be found at:

<http://inova.snv.jussieu.fr/vickie>

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