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ABSTRACT

Lifelong learning is becoming a necessity in the new Information Society where everyone, particularly small and medium sized enterprises (SMEs), must keep up with new technologies. Education and training are of the most importance in this updating. An interdisciplinary and inter-university work group called "Canalejas" (Spain) has developed a multimedia educational CD-ROM, "Basic Course on Telecommunications for Small and Medium Sized Enterprises," a client-server application which includes the "Virtual Class" distance learning environment and interactive multimedia courses on telecommunication services. This paper addresses the technical and educational issues addressed in developing a multimedia educational CD-ROM, beginning with an overview of the objectives and presentation of the work group, educating for the Information Society/lifelong learning, and new technologies for distance learning. The CD-ROM course is then described, including hardware configuration, distance learning environment, and steps in the multimedia development methodology. Two figures present the user interface. (Author/AEF)

Virtual Class: Distance Learning for Small and Medium Sized Enterprises in the Spanish Region of Castilla y León

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Abstract: Long-life learning arises as a new necessity in the new Information Society, where everyone, but especially Small and Medium Sized Enterprises (SMEs) workers, have to catch up with the new technologies continuously. Therefore, education and training are of the most importance in this updating. Research Work Group *Canalejas*, has developed a multimedia educational CD-ROM titled "Basic Course on Telecommunications for Small and Medium Sized Enterprises", mainly addressed to SMEs training. This paper describes the technical and educational issues addressed by the project of developing a multimedia educational CD-ROM.

1. Objectives and Presentation of the Work Group

The aim of this paper is the presentation and description of our approach to a multimedia educational CD-ROM titled "Basic Course on Telecommunications for Small and Medium Sized Enterprises ". It includes a distance learning environment called *Virtual Class* and some interactive multimedia courses on "telecommunication services". Virtual Class is based on the use of telematics networks, what makes possible the interaction between teachers and pupils. It is a server-client application, which uses the Internet protocols. Both the client side and the courses are distributed on the CD-ROM.
The CD-ROM is the result of the coordinated action among different kind of specialists, mainly Pedagogues and Telecommunication Engineers, implemented in a Research Work Group called "*Canalejas*". The research

of this interdisciplinary and inter-university group is focused on "Educational Multimedia and Telematics Networks in an Educational Context", evaluating the possibilities and advantages of applying Information and Communication Technologies (ICTs) to the learning process. Canalejas Work Group is integrated within CEDETEL (Center for the Development of the Telecommunications in Castilla y León), a Technological Center that has leading Small and Medium Enterprises into the Information Society as one of its main objectives.

The CD-ROM is primarily addressed to SMEs' employers and employees, although it will be subsequently extended to cover other segments. It has been evaluated in a course offered to SMEs in Cedetel during September-October of 1997 and we will have the opportunity of evaluate it again in two incoming projects: a course about Distance Learning for future teachers at the University of Salamanca and a course for physical disabled people within an ISPO (Information Society and Project Office) European Community initiative. The last project aims at raising awareness about the possibilities of distance learning and teleworking in people with disabilities.

2. Educating for the Information Society: Long-Life Learning

We are now living a historical period of technological change; we are living the evolution towards an Information Society . But citizens are not prepared for the new society yet. As a matter of fact, our countries' educational systems are designed to satisfy the needs of an industrial society, not to the ones of an information society [Tiffin and Rajasingham 1997]. People have to be trained in the use of new technologies and familiarize themselves with them; and ICTs have to be introduced into our educational systems, at all levels. All over the world raises the demand for more training. The future of a country does not depend on its natural resources anymore, but in the capability of its population, that is, in the education they receive.

In the ancient Greece, the twenty-first years constituted a training period for the adulthood. And this educational tradition has had an intense influence in the occidental educational systems, but this idea is changing and the training process has begun to be considered as an activity that lasts a lifetime. With the emergence of the Information Society, everyone must upgrade their skills constantly and obtain new qualifications. And this acquiring of new aptitudes and abilities should therefore no longer be limited to formal schooling (primary, secondary and higher education), but should involve all sections of society: youngsters, middle-aged and older people; people at all levels of vocational qualification; people in work and the unemployed [Delors 1996].

In an especial way, this long life learning will affect SMEs, due to the job transformation process. The introduction of ICTs together with organizational changes is affecting employment in demand for more and broader skills and for fewer unskilled people. Remaining competitive SMEs increasingly depends on their capacity to absorb and use new technologies, and to have access to knowledge. SMEs must face these challenges, introducing themselves into the Information Society and making use of the tools and services it provides.

Education and training will play a central role in the advance towards an information society, which will be a learning society, as asserts the White Paper on Education and Learning of the European Commission [European Commission 1995].

3. New Telematics Technologies: Distance Learning

Regarding the needs of long-life learning for all sections of society, access should be ensured to everybody. At this point, ICTs, and particularly telematics networks, are going to play a very important role, not only as a training content, but also as a mean to supply the training itself.

The telematics networks, in an educational context, create a new learning environment, in which teachers and pupils do not have to coincide in space or time, making learning more accessible. We can make use of the term distance learning, which has the following advantages:

- Distance learning is very flexible, since it makes the learning process independent from space or time.

- Being independent from space lets students learn where they want. This means distance learning can attend people living in rural or peripheral areas and people with physical disabilities.
- Being independent from time lets students learn when they want, at their own pace.

- It is more constructive, since students reach knowledge through an active learning process; teachers become a background guide, while pupils play the main role.
- It is more appropriate during adulthood. Adults have a record of educational experiences and can make the most of the learning process by their own. Besides, they feel better attending distance learning than going back to a classroom.
- It can be cheaper than traditional learning, once the initial investment is exceeded. This fact is especially important in SMEs, which do not usually invest in long-life learning.

All these features make Distance Learning suitable for training SMEs' employers and employees.

4. CD-ROM "Basic Course on Telecommunications for Small and Medium Sized Enterprises"

Our labor and efforts to provide SMEs with a training tool suitable to their needs have result in the publishing of the CD-ROM "Basic Course on Telecommunications for Small and Medium Sized Enterprises".
The CD-ROM includes a distance learning environment, called Virtual Class, and some courses on Internet and its Tools and Telecommunication Services. These courses run within the Virtual Class environment. They are mainly addressed to SMEs' employers and employees, although they can be extended to other adult segments who have not previous knowledge of the contents.
In the CD-ROM development process took part a regional-wide-scale enterprise named Divisa Informática, S.A., which is at the same time partner of CEDETEL. They took on the distance learning environment development. As for the courses, the work group from the University of Valladolid (Telecommunication Engineers) assumed the tasks of programming and production, while the work group from the University of Salamanca (Pedagogues) undertook the structuring and presentation of the contents. The audio production was carried out by *Audio-visual Media and New Technologies Service*, from the University of Valladolid.
The CD-ROM is designed for Windows 95 and the PC requires this minimum hardware configuration:

* CD-ROM drive
* Pentium/90 MHz microprocessor
* 16 MB of random access memory (RAM)
* 3 Mbytes of free hard disk (HD) space
* Sound card
* Graphics adapter card capable of displaying 16 bit color at 800x600 pixel resolution

4.1. The Distance Learning Environment

Virtual Class is a distance learning environment for giving and receiving distance courses, with the aid of telematics networks, that can be accessed through services like INTERNET or INFOVÍA [1], as it uses the Internet Protocols. It is a client-server system; the server is located at Divisa Informática (e-mail, news, web and data base servers), while the client is distributed in the CD-ROM.

[1] INFOVÍA is a public service offered by Telefónica since December 1995 and gives access to INTERNET/INTRANET networks from any point with telephone connection, in the whole Spanish country. The cost of the service is the cost of a metropolitan telephone call.

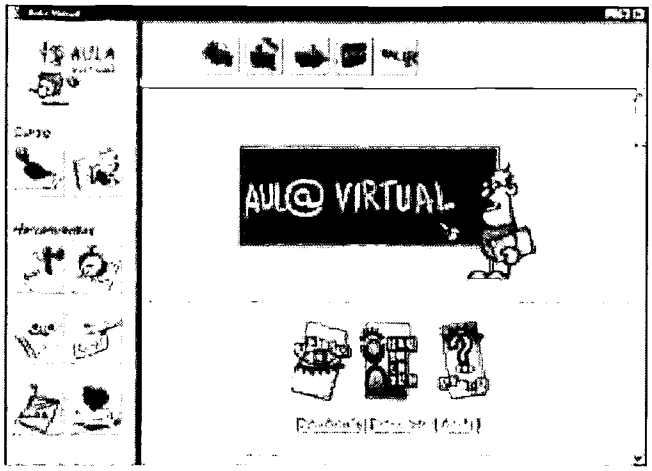

Figure 1. Interface of Virtual Class

One of the main drawbacks of distance learning has been the lack of opportunities of interaction between teacher and pupils. Therefore interaction and feedback have to be improved, and suitable tools have to be provided to ensure them. But both teachers and students have to become aware of the new patterns of communication and become comfortable and familiar with them. They also have to be prepared to resolve the technical problems they may come across. In Virtual Class, teachers and students can make use of e-mail and news to communicate. Teachers can also publish events, related to a specific course.
Besides the communication tools there are other ones that let the student examine the contents of the courses, check bibliography or view other students; and the teacher manage the course (add new students to their course, supervise their accesses, add new bibliography...). All the tools are fully integrated into the Virtual Class environment [Hernández et al. 1997].

4.2. The Multimedia Courses: the Development Process

Besides the interface *Virtual Class*, the CD-ROM includes some multimedia courses on Internet and its tools (World Wide Web, Electronic Mail, Telnet, ...) and telematics services. These courses run within Virtual Class, so the tools it provides can be used all together.

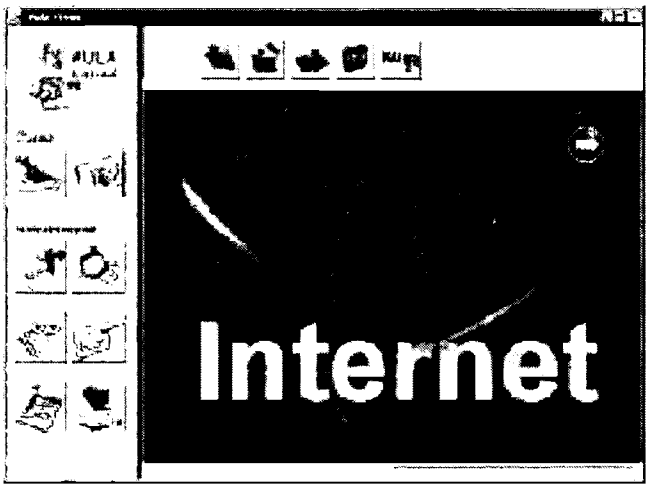

Figure 2. Sleeve of the Course *Internet*

The courses have been developed with Toolbook Instructor II, an authoring system for Microsoft Windows. Toolbook is an object-oriented development environment that provides drawing tools for creating objects and a full-featured programming language, called OpenScript, for programming object behavior.

Authoring languages are supposed to be easy to use in order to let people who are not familiarized with programming design create their own titles. The lack of suitable tools is the main reason for not introducing Information Technologies in the learning process. In this way, if the teachers create their own programs, they can adapt them to their students' needs.

The result of our experience has not only been the development of some courses, but also, the outlining of a methodology, that identifies the steps involved in managing a multimedia project:

1. Planning the project. Before starting developing a title, we should think through every aspect of the project. At this point, we must specify:
    A. Content: Internet and its Tools and Telecommunication Services
    B. Audience: SMEs employers and employees, although extensible to other adult segments, having no previous knowledge of the contents of the courses.
2. Prototyping the title. Audiences respond strongly to how a title looks onscreen, how information is presented, and how easy is to move around the title. A design prototype should specify the fonts and colors to use and how the navigation system works and looks. This last point is very important in a hypermedial document. Since our audience has no knowledge of the contents, the navigation is entirely guided. Starting from an index, you can navigate to each of the courses, and within the course the navigation is mainly linear. Besides, there are two type of hotwords: the first type show an emergent window when you click on them; while the second type of hotwords navigate to another page. In this page, you just can go back to the first one. In this way, we are ensuring the pupil will not skip out some of the contents or get lost.
3. Developing the content. All the screens have to be outlined, with the text, graphics, videos, sounds or animations they display. Standards for the media have to be established, like the quality of sounds and graphics.
4. Authoring the title. During the authoring phase, contents and media are integrated into its final form. This step comprises using an authoring system; in this case, Toolbook Instructor II.
5. Testing the title. This step involves:
    A. Proof-reading the content onscreen
    B. Checking the title's technical performance
    C. Verifying the title works on different hardware configurations
    D. Evaluating the title with potential students. For this purpose, we organized different pilot experiences with the teachers of the Pedagogy Faculty of the University of Salamanca. They were suitable pupils, as they had no previous knowledge of the contents. These experiences made us return to step 3 or even to step 2: we had to change some animations, some texts (without using acronyms, for example)...
6. Preparing the title for its deliver on CD-ROM. This step consists on packaging the application to run off of CD-ROM, building a master copy and handing it off to a facility. The directory structure must be defined for the master, where all the files are organized together, so the title can locate and retrieve the files as it needs them. Our master includes an autorun file, so the application installs, or runs automatically, as you insert the CD-ROM.
7. Evaluating the title. This is the step we are now located. Virtual Class and the courses have already been used in the course "Telecommunications for Raising Competitiveness in Small and Medium Sized Enterprises", financed by the *Economic Development Agency of Castilla y León (ADE)* and the *European Social Fund (ESF)* and given in CEDETEL. But before drawing conclusions, we are waiting for other two experiences where the CD-ROM is going to be used:
    A. In a course about "Using ICTs in the Learning Process", addressed to future teachers at Pedagogy Faculty in the University of Salamanca.
    B. In a course for physical disabled people within an ISPO (Information Society and Project Office) European Community initiative. This proposal aims at supporting and promoting widespread integration of people with disabilities into the Information Society, informing them about already existing telematics services and Information Technologies. More information can be found at the Web Site http://www.ispo.cec.be/ispo/call/proj97.html#C97110.

Besides the methodology for developing interactive multimedia titles we have here explained, our labor has also resulted in the generation of a document with some advises for developing this kind of titles. Although none of them are new, we wanted to compile them as a result of our experience. Some of them are [4]:

- Multimedia, that is, integrating two or more media effects (text, graphics, sound, video, and animation) can be a powerful communications tool and can accelerate and reinforce learning. Nevertheless, we should not exceed media effects, because they may distract the student and lead him away from what is still the most important: the message.
- The basic unit is not the page, but the screen. For example, we have to take into account that eyes get tired more quickly reading onscreen, so we will not fill it with too much text: at the most, a third part of it.
- We should choose readable fonts, using only one or two: mixing too many fonts clutters the design. The font size and style should be used to convey hierarchy. Unreadable colors and type styles should be avoided.

5. Conclusions

With the advent of the Information Society, all countries, and especially those lacking a competitive industry, are making effort in the human resource development, that is, they are investing in training their population. At this point, SMEs have especial significance in a decentralizing economy.

But the Information Society is not only important as a content, but as a mean too: we should and we must make use of the ICTs to provide access to the whole society. In an educational context, ICTs give us the opportunity of distance learning, that offers many advantages, mainly based on the facts that it is independent from space and time. For SMEs, a very important advantage is that distance learning may result cheaper than traditional learning.

The labor of the work group Canalejas in trying to introduce ICTs into the learning process has got a result in the publishing of the CD-ROM "Basic Course on Telecommunications for Small and Medium Sized Enterprises". During our work, we have outlined a methodology and compiled some advises for developing multimedia titles. We are now applying them to the developing of a mathematics course in CD-ROM for 7 years old aged children and another one about electronic commerce.

Finally, with the impressions from the pupils of the course "Telecommunications for Raising Competitiveness in Small and Medium Sized Enterprises" and the results of the two courses we are giving to future teachers and physical disabled people, we will come to definite conclusions about distance learning and developing CD-ROMs and multimedia titles.

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