Combining hypermedia and network technology to support active vocational guidance

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LOOKING FOR WORK, a project aimed at establishing an efficient link between the job world and people looking for a job has been developed. The result is a system running on a local network of PCs under WINDOWS 3.11. The system combines two different environments, an educational environment and a data base management system, by means of an "expert" interface.

This paper describes the project and analyses the structure of the system, relating it to the proposed aims. The educational component is illustrated and shows how the technical choices correspond with the users' pedagogical needs. The initial results of a test of the system are briefly discussed.

Keywords: Multimedia educational systems, vocational education, network technology in the transition from school to work

1. Introduction

Technological innovations competitive strength of developing countries in tradeable goods and changes in socio-economic conditions give rise to great changes in the skills required by labour environment: on the one hand, a number of abilities become inappropriate and obsolete; on the other, new skills and qualifications are needed to realise potential productivity gains. The growing awareness of these problems is at the basis of the socio-political interest in research of the role played by the new information and communication technology in the training (educational) function and updating of the related activities (European Commission 1993; 1995; 1995a). Work in this direction is carried out following different lines. For example, some authors focus upon the identification of new trainers' skills (Bessiere and Guir 1995); others work on new curricula or on the integration of Information Technology into old ones (Denisov and Dillon 1995; Forcheri et al. 1990).

Other proposals concern the use of advanced technology as a bridge linking academic preparation with professional mode of thinking and build concrete applications which help students overcome the gap between profession and education (Blandow and Dyrenfurth 1994; Hill and Buerger 1995). Others employ telecommunication-centred interactive multimedia technology to realise learning environments specifically devoted to the training of employees (technical staff) of small and medium size enterprises (Tritsch and Knierriem–Jasnoch 1995). Following an analogous philosophy Gardner and McNally (Gardner and McNally 1995) discuss the use of interactive video in initial teacher training. Other authors suggest teaching sophisticated software application by integrating it with a learning environment. This idea is applied to the teaching of several professional subjects, for example electronic mail (Zhang et al. 1995), and electronic engineering (Ponta et al. 1991). Grega and Doughty introduce the concept of open architecture applications in educational control laboratories (Grega and Doughty 1995). In (Okamoto et al. 1995) an experiment of using multimedia for teaching macro economics is described.

Less attention has been paid to the study of the potential of the new technology as a means to support active vocational guidance. However, in recent years high unemployment rates in industrialized countries have created the need of

efficient methods to help young people enter the job world. Technology, especially network and hypermedia systems, seems to provide a good opportunity in this direction (see, for example, http://www.tin.it/jobonline). Our work is framed within this context. In particular, a joint project between the Institute of Applied Maths of the Italian National Research Council (IMA-CNR) and the Ligurian Employment Agency of the Italian Ministry of Labour and Social Security is being developed. The project, called *LOOKING FOR WORK*, focuses on the analysis of methods and tools which allow to establish an efficient communication between two realities: the job world, in particular actual job opportunities and requirements, and the search for a job, in particular personal skills and expectations.

The result of our work is a system, combining two different environments, an educational environment and a data base management system, by means of an "expert" interface. The system works on a local network of PCs under WINDOWS 3.11. A prototype version of the project has already been tested.

In the following sections, we shall analyse the project, paying attention to educational objectives. In particular, we shall illustrate its overall structure and the educational environment. We shall describe the technical choices made in relating them to the pedagogical problems taken into account. Finally, we will briefly discuss the results of the test.

2. Motivations

Notwithstanding the occupational crisis, providing young people with skills and abilities to help them in the transition from school to job does not seem to be an objective of Italian schools. Only in a few cases — mainly owing to personal initiative of teachers or headmasters of vocational schools — is general information about job problems and opportunities given. Consequently, students leaving school are usually not aware of the problems or the ways of communicating and thinking the job world; they do not know how to act in looking for a job compatible with their interests, what kind of skills they have to improve or acquire in order to cope with the actual needs of employers; they are unaware of the laws regulating

or facilitating entry into such a world. This knowledge is difficult to acquire on one's own. It is often found in partial form, based on the experience of others, or in texts written in a bureaucratic or legal language that is boring to read and difficult to understand for a layman. Moreover, as a rule, people do not achieve the skill of "writing about themselves" at school, and especially not the skill of presenting their own personality, expectations, abilities. Such a skill is needed in drafting a "good" curriculum and/or a presentation letter when applying for a job. Furthermore, Italian schools do not usually help students in developing strategies to model real situations: to understand the variables and their relationships, to interpret the data, to analyse the effects of a perturbation; to single out the constraints; to foresee the effects of a choice, etc. Yet, modelling capabilities are fundamental in planning self-employment.

As to the other institutions that should help in looking for a job, they do not have such educational objectives; also, the support they give does not comprise efficient information methods for young people to learn the actual possibilities and to maximize the number of firms to be approached. Finally, it must also be observed that the firms lack operative methods to ascertain the actual value of human resources available as well as the effective tools to orient their search for personnel.

Within this context, an effective vocational guidance should be capable of: 1) creating a link between people looking for employment and employers; 2) preparing young people to approach the job market. Accordingly, methods and tools should be realised with the following scope:

- To help people develop knowledge and skills so that they may plan efficient strategies in looking for a job;

- To give the unemployed a real opportunity of using such capabilities in order to maximize the number of firms to be approached;

- To give firms an effective background about the human resources available on the labour market;

- To give employers facilities to identify persons to be contacted for vacant positions. In this respect, technology is endowed with a

considerable educational potential, for several reasons:

- The computer is a familiar and attractive tool for young people who are thus motivated to learn;

- Multimedia systems can be employed to furnish a large amount of information in an efficient way tailored to support the user's activity. They can thus be employed to acquire the basic capabilities required for the job and to inform people about the labour market.

- Electronic network allows the users to share resources and to communicate and process efficiently information from different sources. Thus, a user may transmit information about him/herself and his/her expectations to a data-base which in turn is contacted by associations of employers and public offices for labour;

- Experts systems can be built to extract, at least to some extent, relevant information from texts written in an informal way. Thus, users can write curriculums to be inserted in the data base without hindrance;

- The graphics facilities offered by many systems allow setting up powerful data bases with easy-to-use query interfaces. Thus, people offering jobs can look for applications in the data base without wasting time in technical problems. *LOOKING FOR WORK* has been developed on the basis of these considerations.

3. Organisation of the system

The system is therefore addressed to two different types of users: 1) persons looking for work, in particular those aged between 15 and 27, with a school level ranging from secondary school diploma to university degree; 2) firms looking for personnel. In the following description, we shall pay particular attention to the features embedded in the system in order to adhere to the educational needs of people looking for a job.

From the educational point of view, the structure of the project is mainly based on the motivations illustrated in the previous section. The system is thus conceived as the integration of two different environments, independent of each other and connected by means of a *supervising module*:

- an *educational environment*, to be used to learn about the job world and to acquire basic skills, such as writing a curriculum vitae, understanding advertisements, analysing possibilities, simulating economic situations, etc.;

- a *search for personnel environment*, aimed at creating an efficient link between young people who are at the threshold of the job world and the employers.

This conceptual structure is realised by combining different technologies, mainly hypermedia, communication in a local network, and intelligent data base management.

The system comprises three components:

1) a *hypermedia environment*, which includes:

- a *hypertext*, giving information and knowledge about the job world;

- an *editing environment*, which assists users in building their curricula;

- a *simulation environment*, which guides users in planning an economic activity;

2) an *intelligent data base manager*, that includes:

- *data base* with the organised information of the curricula;

- an *update module*, aimed at organising this data base;

- a *query system*, which allows firms to search for personnel according to their various requirements;

- an *expert module*, which extracts the relevant information from the curricula and structures it according to the format of the data base;

3) a *communication module*, which makes it possible to connect the hypermedia with the data base environment.

Figure 1 shows overall organization of the system and the functional links between its various components.
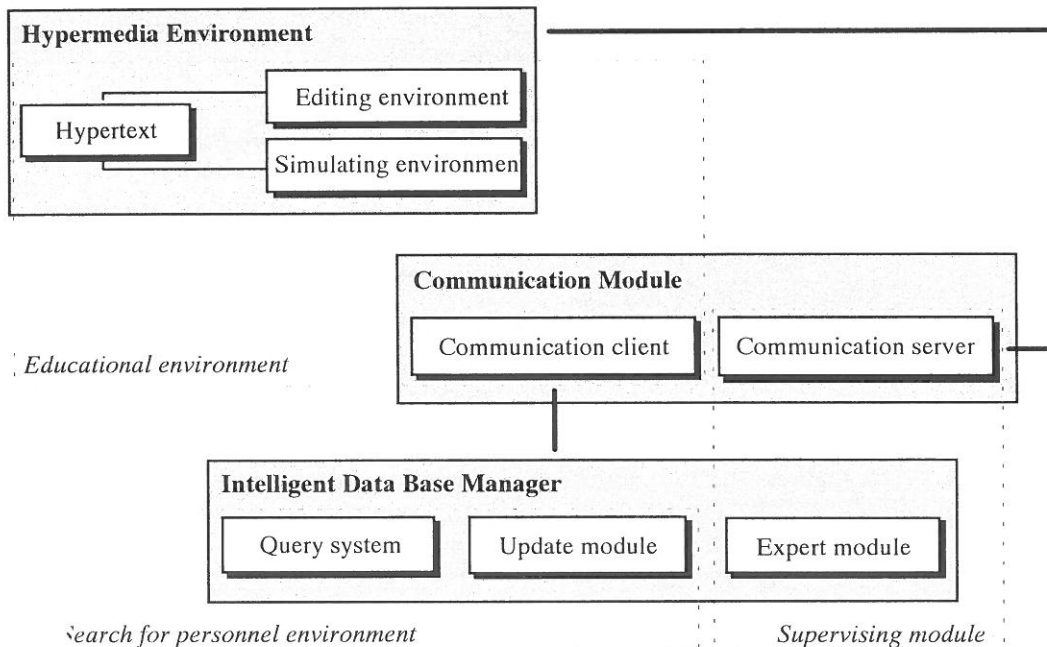
Fig. 1. Overall organisation of the system. People looking for a job interact with the hypermedia environment, and use it to learn about the job world and to transmit information to the data base. Those offering a job use a query system to seek people in the data base. The interface between the educational environment and the data base is the expert system, which extracts relevant information from that furnished by job seekers through the educational environment.

4. Network Architecture

The system is organised in a network of PCs (see Figure 2). Components of the system are:

- The server on which the data base, the update module, and the expert module are installed. The expert can be executed locally to update the data-base. The data base can be queried locally or from the clients;

- The clients on which the educational environment is installed;

- The clients on which the query system is installed;

- The computer network (of MAN — Metropolitan Area Network — type) whose facilities are used for communication with the server. The server is located at the Ligurian Agency. The clients on which the educational environment is installed are located in public offices who usually provide help in finding a job. Other clients are located at employer associations authorized to query the data base.

5. The educational environment

Knowledge and skills required to successfully apply for an employment are quite different from those needed to plan an autonomous activity. In the first case, people should be able to describe their skills and attitudes in a well-structured form and concise style, emphasizing those aspects which can provide interest. In the second case, the applicant has to evaluate carefully if he/she possesses the capabilities, skills and financial support needed to engage in an economic activity. The structure of the system takes into account these aspects. Basic notions and specific knowledge of different kinds of job are given through the hypertext. The possibility of making him/herself known to employers is given through the editing environment; learning how to plan an activity is made possible through the simulation environment.
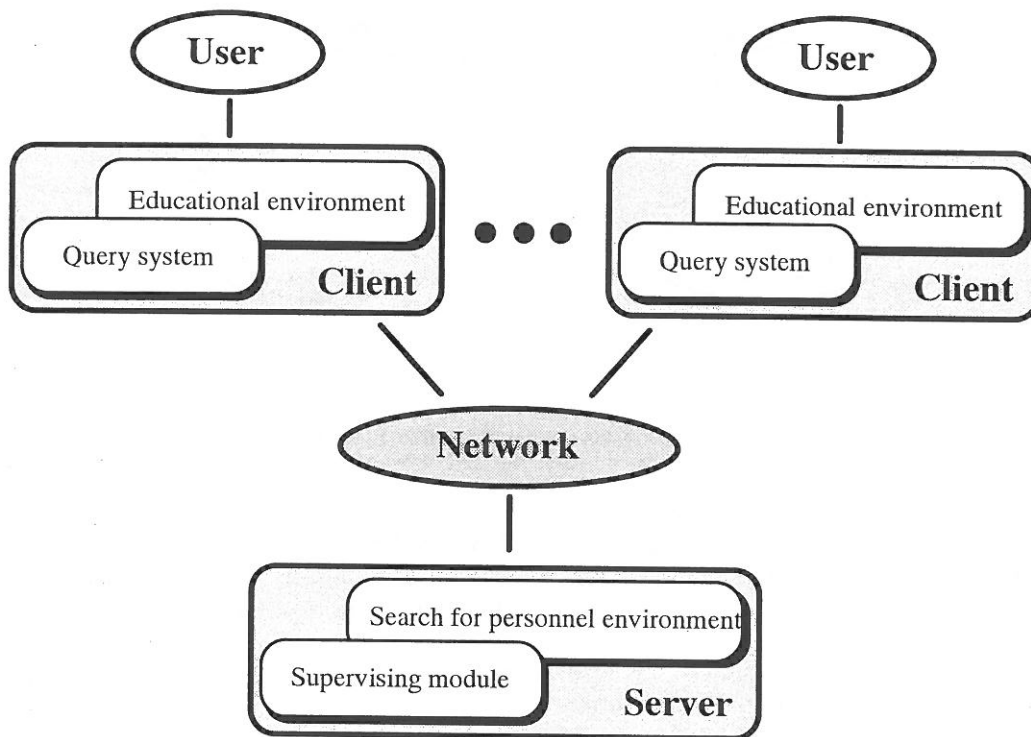
Fig. 2. Network architecture

6. The hypertext

The content. The hypertext constitutes a guided itinerary to orient people who is looking for a job. In fact, people usually tackle the problem of looking for a job whitout a methodical way. On the contrary, looking successfully for a job requires knowledge of the job market, low, possibilities, etc., and consciusness of the personal expectations, attitude, skills, educational preparation, etc. Consequently, Italian authorities and unions carried out several socio-political studies proposing structured paths to help unemployed to individuate possible jobs of interest. The structure and content of the hypertext are based on these studies, in particular AA.VV. 1994 and CID-CGIL 1994.

The hypertext is organised as a book, subdivided in 10 chapters as follows:

* Introduction to the job world: psychological attitude towards the job; the influence of the job on the affective sphere and on the personality; self-analysis as a tool for looking for a job suited to one's own personality and expectations; the exploitation of one's capabilities, skills, and qualities as a tool to find a job; a first glance at the possible choices (chapters 1,2,3);

* Vocational training: opportunities, requirements, stages, specialization courses, etc. (chapter 4);

* Problems and opportunities related to employment: labour legislation, opportunities for young people, facilities for disabled people, sectors of employment (public and private), evaluation of the sources of information, etc. (chapters 5,6);

* Problems and opportunities related to self-employment: legislation, difficulties, cultural requirements, fiscal aspects, etc. (chapters 7,8);

* Job centres and other sources of information about jobs available (chapter 9);

* Statistics on the Ligurian situation with respect to age, sex, kind and level of studies: working population; distribution of working population with respect to the categories of
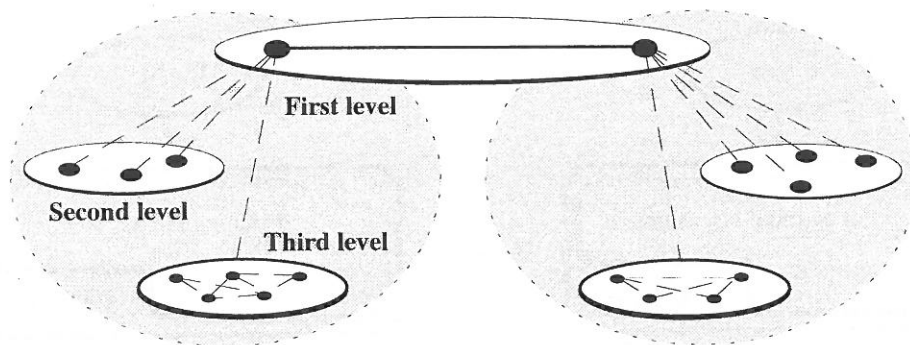
Fig. 3. A portion of the knowledge. Shaded circles represent chunks, black circles represent basic units. White ellipses correspond to levels. The continuous line indicates the link between chunks; while dashed lines indicate local links.

jobs and production fields; time-lapse between the end of school and the first employment, etc. (chapter 10).

The conceptual model. The choice of the conceptual model to adopt for knowledge representation is quite a delicate problem, as the system is meant for people of different backgrounds, age, scholastic preparation, sex, social origin, perception of the job world, etc. Different needs must thus be taken into account: some persons have to be prodded to acquire a positive attitude and personal initiative towards the job problems; others know what action to take but lack of information as how to realize their ideas; others have a theoretical idea of the problems and need help to understand the operative meaning. Moreover, there are several kinds of jobs (stages, self-employment, social works, part-time, teleworking, etc.), each with different rules, thus the material has to be organised in such a way that people can give a general glance to all the possibilities and then concentrate attention on the kinds of job of particular interest. The conceptual model of the hypertext has been realised on the basis of these considerations. The knowledge is seen as a net of chunks connected to each others by conceptual associations. Each chunk of knowledge is structured according to three different levels of depth: 1) introduction; 2) further information; 3) operative interpretation. Each level is made of a set of basic units of knowledge. This choice allows the user different keys to read the hypertext, which can be employed independently of each other.

The first level is formed by the basic ideas about the topic at hand. The second level goes in depth into the topic and is aimed at those particularly interested. The third level provides the background needed to operatively understand the topic.

For each chunk of knowledge, the three levels are represented respectively by a page (first level) a pop-up window (second level) and a help window (third level). From each page it is possible to return to the previous page, move on to the next, and to the other pages conceptually linked. Links between pages realize the links between chunks of knowledge (see Figure 3). The pop-up windows and the help window can be accessed only from the corresponding page. Local links realise these accesses. Figure 3 schematizes a portion of the knowledge. Figure 4 shows an example of the three-level organization of a chunk of knowledge.

7. The editing environment

The editing environment, that can be accessed from chapter 5, is made up of a simplified editor, a guide and a communication module. The environment is explicitly designed to help people draft curriculums. As a consequence, it is endowed with features to help users overcome difficulties involved in this task. Difficulties are of two kinds: style and content.

As to style, the editor provides the user with a form to fill in. The form frames the curriculum according to a structure we arranged

with a group of experts. Depending on his/her choice, the user can either write the curriculum on his/her own or fill in the form with his/her data. In any case, the editor allows the user the control of his/her writing only. As to the content, the guide helps the user insert into the curriculum all useful information. For example, inexperienced people usually do not know that all past experiences demonstrating capabilities of working as a team, of leadership, of management, etc., should be mentioned in a curriculum. The guide has been realized providing each item of the form with a brief explanation completed by a number of examples. For each item, the guide is activated upon user's request (see Figure 5).

The communication module allows the user to place his/her data at the disposal of employers. The user signifies this request by selecting a button; the curriculum is automatically sent to the expert module for further processing and insertion into the data base.
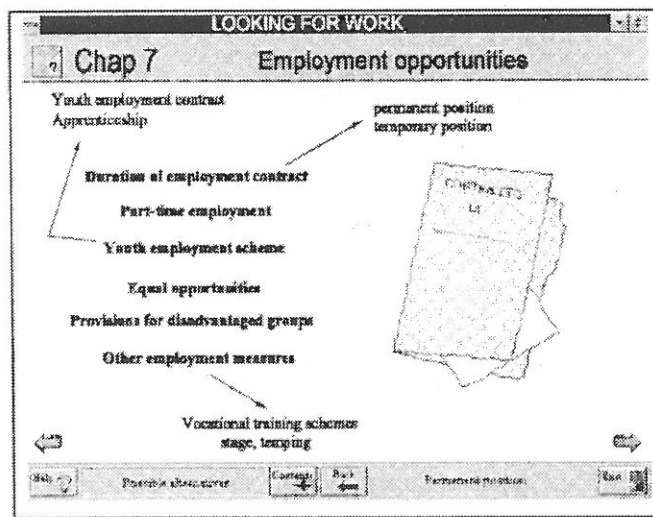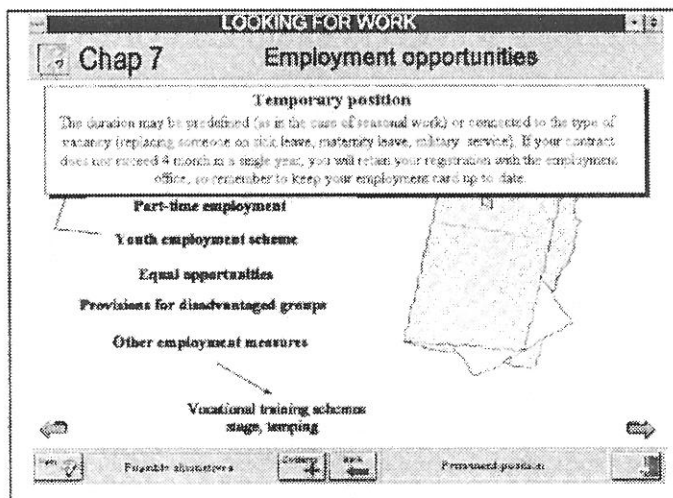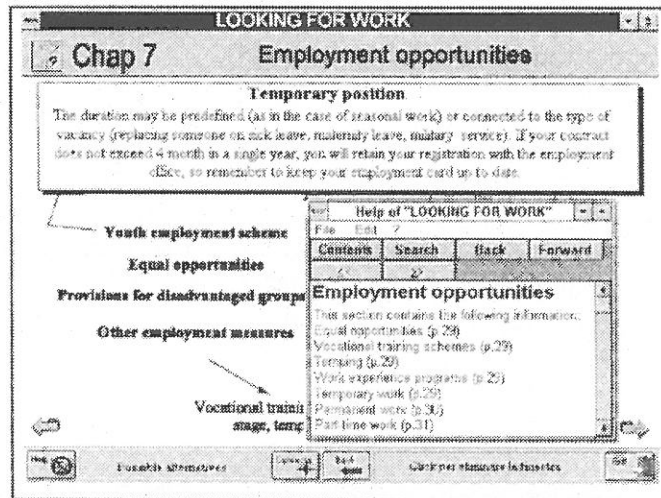

Fig. 4a.

Fig. 4b.

Fig. 4c.

Fig. 4. The page concerning different kinds of employment is displayed in Figure 4a. Figure 4b shows the pop-up window referring to temporany employment. In Figure 4c the help window referring to various opprtunities of employement is displayed.

8. The simulation environment

The simulation environment, that can be accessed from chapter 7, is constituted by a guide and a series of scenarios to analyse economical hypotheses. The environment is designed with a twofold aim: 1) to help people which intend to engage in an autonomous activity, to understand which factors should be taken into account to determine if their ideas have a chance of success; and 2) to guide them in understanding their own the problems involved.

As to the first aim, the guide presents the user with a series of questions regarding planning and management (estimate of the market potential, estimate of expenditure and revenue, fi-
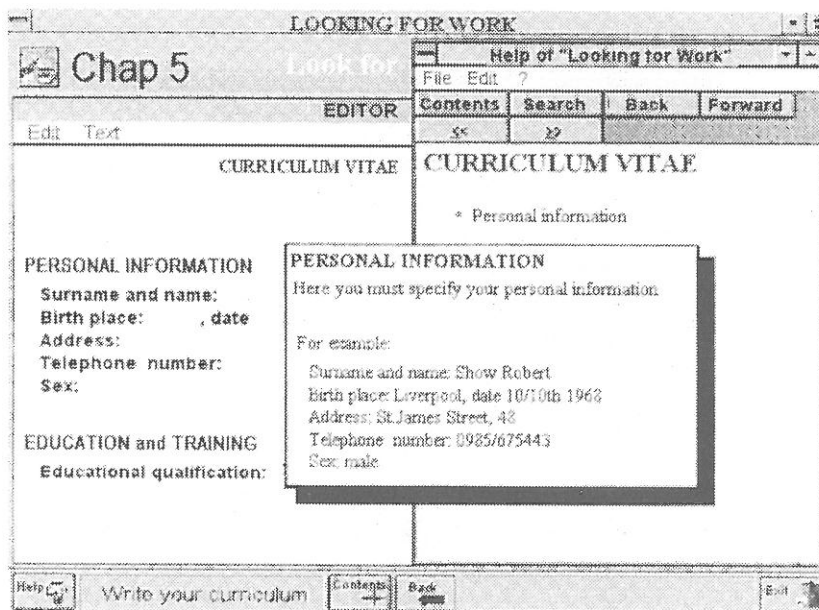

Fig. 5. An example of use of the guide.

nancial needs, type of personnel, etc.). The questions introduce problems, analyse the variables involved and their links and guide the user towards their formalization.

As to the second aspect, the scenarios enable the user to experiment and simulate the economic problem presented by the questions. Scenarios, which consist of tables of values, represent economic situations obtained from a model by changing the values of parameters. To each question, a what-if model is connected. Each model consists of a series of variables which may be connected by some mathematical law. Upon user request, one or more scenarios relating to the model can be activated. New scenarios can be built by the user as well.

9. The pilot test

A pilot test has been carried on aimed at analysing to what extent conceptual and technical choices underlying the system make it apt at being used for self-education. In fact, the system is to be installed in public orientation center, and be used autonomously by persons asking for information about the job world.

Fifty persons (20 males and 30 females) in the age range between 15 and 24 and school range from upper school to university were selected as subjects for individual case studies. They were selected in consultation with Ligurian Agency for Employment among the persons who usually go to the Agency to look for information on how to search for a job. Before the test all of them had limited training of the use of computer and software. Each subject took part in the experiment alone. On the average, users used the system for two hours. A researcher was present in the computer room for supervision and help

if needed. At the end of the session the subjects completed a questionnaire about the system. The questionnaire was devoted to analyse the validity of the tool proposed with respect to interest of the content, efficacy of presentation, technical difficulty.

As to the hypertext, males and females gave quite different judgements of the hypertext and of the difficulties faced in using it. In our opinion, this is mainly due to the fact that females, in the present situation of high unemployment, are not encouraged to look for a job as males are. In general, subjects showed awareness of the importance of the topic, were satisfied with the kind of presentation and found few difficulties in using the hypertext (see Table 1). However, from the direct observation of people behaviour during the pilot test, we observed that potentialities of the hypertext were not fully utilized. The majority of subjects used it mainly in sequential way. Knowledge of the second level was recalled quite frequently, while little reference was made to knowledge of third level. In our opinion, this behaviour is explained by the fact that our sample group consisted of persons facing job questions for the first time, and the third level of knowledge is not at the introductory level. Almost everybody found it easy to use the tools for navigation. The main difference in the use of the hypertext is that younger people got lost when trying to navigate by associations. In our opinion, younger people were more interested in testing the potentiality of the tool rather than in the content. Finally, we noted that the table of contents was a useful tool in regaining control.

As to the editing environment, almost all were quite excited about the possibility of writing their curriculum. The majority of subjects completed the form without syntactic difficulties.

	Unsatisfactory			Average			Good		
	Females	Males	Total	Females	Males	Total	Females	Males	Total
Topic interest	16.7%	0.0%	10.0%	58.3%	37.5%	50.0%	25.0%	62.5%	40.0%
Presentation efficacy	8.3%	12.5%	10.0%	25.0%	12.5%	20.0%	66.7%	75.0%	70.0%
Easy to use	8.3%	0.0%	5.0%	16.7%	50.0%	30.0%	75.0%	50.0%	65.0%

Table 1. General evaluation of the hypertext. Percentage of answers for each judgement.

		Unsatisfactory			Average			Good		
		Females	Males	Total	Females	Males	Total	Females	Males	Total
	Interest	8.3%	0.0%	5.0%	41.7%	37.5%	40.0%	50.0%	62.5%	55.0%
Easy	to fill in the form	8.3%	0.0%	5.0%	75.0%	50.0%	65.0%	16.7%	50.0%	30.0%
	to add personal data	58.3%	37.5%	50.0%	25.0%	50.0%	35.0%	16.7%	12.5%	15.0%

Table 2. Evaluation of the editing environment. Percentage of answers for each judgement.

On the contrary, they found it difficult to fill in the items of the form concerning their personality and interests. The guide was a valuable help in filling in such items (see Table 2). As to the simulation environment, the number of subjects using it was small to claim valid conclusions. Only five, specialising in economic studies, tried using the environment. Obviously, they found it interesting and easy to use.

10. Concluding remarks

LOOKING FOR WORK is an operative proposal of using multimedia and net technology as a tool for orienting young people in looking for a job. At present, the system is regularly used in the orientation centers of the Ligurian region. In fact, in Italy rules concerning the job market vary from one region to another and the present version of the system refers to the Ligurian situation. Due to the interest provoked by the system, next year the Ministry of Labour and Social Security will support a project aimed at realizing a new version of the system apt to be used at the national level.

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