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# PROPOSING A KNOWLEDGE NETWORK TO ASSIST EDUCATION, TRAINING AND LEARNING

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***ABSTRACT***

Based on a current project to support distributed education with strong co-ordination requirements, the authors developed a framework to assist education, learning and training needs using common available technologies like the World Wide Web and databases.

The framework is supported by an infrastructure that deals with structure, security and intellectual property rights (ipr) issues. This will lead to a novel propose of a value added chain for the education business, where teachers and students play an equal part on the system both as producers and consumers.

The system aim is supporting maximum flexibility for both teachers and students. The system also provide the means for treat them as clients that produce, share and consume contents organised in well known sequences that can be customised according to different situations regarding the precise context of education, training and learning.

The paper will present the system been developed resulting from lessons learned from its application to a real world context. The application consists of a group of graduate students having an initial phase of presential teaching. In a second phase those students are distributed in a variety of contexts (places and institutions). The second phase will be distributed with each student interact from local host institution that can be placed anywhere in the several countries where interests from the promoter exist.

***NEW FORMS OF COMMUNICATING***

The qualification of the human resources, as a competitive factor for any institution, is fundamental to maximise results. The need of the people's constant preparation is also a factor of competitiveness that demands treatment, from the institutions. This treatment translates more and more in the taken care teaching and training actions.

Strategy thinking is not an everyone task, but the institutions will have more and more need of people to discuss, conceive, define, manage, implement and control the release of new strategies, planning new actions and introducing new products to market, reacting with anticipation to its competitors. Also, people need to have a global, regional and local perspective.

The growing importance of the Information Society seats in the development of the internationalisation of the economy and of the markets globalisation, forcing the companies to the development of new products dependent of their innovation capacity and of the fast acquisition of the emergent technologies.

The permanent reduction of the products lifecycle and the capacity of reduction of its time of conception and introduction in the markets, present profound modifications to the companies paradigms of competitiveness. The information became an asset as the computers and communications networks went having a fundamental role in the convergence of the advanced technologies of production and information.

To participate in this new digital economy, we must act in a decentralised and global way, whose matter base excels it is the information and the main tool is the knowledge. Also, decisive factors are competence, creativity and the innovation, these last one understood as the capacity of application of new knowledge with the goal of producing new products and services.

The digital economy obeys to very different paradigms from the traditional ones. The later ones are based in a form of analysing the chain of operations and the chain of value. This analysis is in a perspective of the search for the offer giving total priority to the customer and forcing the manager to maintain a constant attention on market evolution and in particular to customers. The operations chain composition and redefinition is also a very important factor of success of the new business in the digital economy era.

This characteristic of the digital business in the Society of Information allows, with great easiness starting from the information picked up in the most varied sources and for the most several forms, to store, to negotiate, to conceive, to produce, to reconfigure, to manage, to implement and

to control the development of new products, including the opening of enormous opportunities in the field of the teaching, training and learning.

Rethinking the teaching, training and learning as a group of services, in a perspective of the search for the offer, and conceiving it as a product that allows its easy transformation in a service and making it more useful to the students and professionals. It is important to state that, more and more, students are seen as customers, buyers of information and of knowledge.

These customers will intend whenever the teaching and the learning are they useful and give them good warranties of finding better employment. This attitude change forced the teaching, training and learning to a growing use of information and communication technologies with computer networks with special prominence for the Internet and the Web (World Wide Web). This can be seen as a decisive role in the transformation and the creation of a new strategy of facing these areas of the education and professional empowerment.

The teaching and the learning, having powerful tools as the Internet and the Web, can be used to support the creation of nets of competence, formal and informal. Their main goal is to forming competence as tools of development of new products and services, characterised by the intensive use of knowledge resources.

This perspective will allow to conceive a storage system and treatment of information in a group of Web sites that will allow to keep, to adapt and manage with great easiness multimedia information, that is, text, images, animation, video and sound. Also this will allow search through keywords to be included and integrated with the Web.

The Internet and Web technologies will provide proactive exploration and managing of new potentialities for the development of new activities based on people's in an extremely simple way where searches and analyses in all the information stored could be performed.

One of the characteristics of the developed system is the allowing of each net user to have autonomy and to be called and share its information with all the other net users. It allows, based on computer and communications technologies, the management of an informal net of people, formal of production and consumption of information and multimedia communications. This effect turn the net into a powerful tool for the production of contents and an excellent instrument for the teaching, training and learning both for presential and distance teaching.

***TEACHING, TRAINING AND LEARNING IN THE WEB***

The teaching, training and learning constitutes one of the areas of great potential for innovation. This enormous potential can promote modifications in the processes and in the form as these activities are performed. It is currently accepted that teaching, training and learning will meet, in a close future, among economic activities of larger importance.

This potential for the change is due, largely, to the opportunities created by the existence of nets of computers and services, namely the Web and the growing available computation power and mobile communications, as they are the cases of the portable computers, cellular telephones and, more recently, personal digital assistants.

Although they exist countless pedagogic projects using information and communication technologies, few among them introduce the technology together with process redesign of existent practices (largely secular) of teaching, training and learning, mainly in what it concerns to the presential teaching.

The *EFTWeb* project proposes an innovation of the teaching, training and learning process, through the use of the Web by presenting a framework that bases the students and tutors interaction on the materials and tasks to accomplish.

The usefulness for the students of the above concept can be enunciated following three ideas:

1. transform information and knowledge into competence, providing capacity for the resolution of problems of the student day life;
2. teach innovation allowing each student to learn by doing, placing the student before the situation of having to do in order to learn;
3. allow in the learning process, its potential application to a wide spectrum of problems (key technology), contributing to the increase of the productivity and individual competitiveness.

The system should be integrated in the teaching practice in agreement with the sequence:

1. presential classes for the use of the system (practise);
2. administration of contents by grouping of producers;
3. use of the information base for future access by users when in remote locations.

The structuring for the student is based on a simple outline of unit - theme - content. A unit possesses themes and for them corresponds the presential sessions. Each theme has a group of content that aid the transmission of information and of knowledge. Each content constitutes an

independent object of a given format, among the many available for change of multimedia information supported in the Internet.

The organisation form for user access, unit - theme - content, is given by the guide in that a certain sequence of the referred elements is associated to structure contents and to give user a path to explore information. The whole system bases its use on an outline of security that also implements a system of credits that allows to regulate the system use so much as a whole, as an auxiliary to structure each user activity.

To the user with appropriate rights (students and tutors) it is allowed the creation of new guides that can include, in all or partly, already existent guides.

***EFTWeb FUNCTIONAL DESCRIPTION***

This section presents a functional description of the available services in the *EFTWeb* system. Not being an exhaustive description, it is destined to give a panoramic on some services that are available in *EFTWeb*. It is divided into two subsections, being the first one for introducing the services available for all the users and the second to introduce the maintenance services to administrate the system usage.

Some general considerations can be made about the base concepts and terms used in the system. In particular, the following definitions are necessary to understand the system functional description:

- Guides: in the context of *EFTWeb*, a guide is a group of EFT objects. These EFT objects can be other guides, units or contents. A guide is a structure defined in a goal-model that can be reused;
- Units: group of another units or contents;
- Contents: basic element of the EFT objects. It cannot contain another structure type;
- Profiles: it defines the characteristics of access of an user;
- Credits: change currency for the guide or contents acquisition;
- Thesaurus: hierarchical structures for contents catalogue;
- EFT objects: element of the structure of the model that can be a guide, a unit or a content.

The user interface was developed in way to be the simplest and intuitive possible, in that all the options of the menu are visualised if they available. A second help level is given when selected an option of the menu where another menu on the right side of the page appears with the actions in context for the related option. This way, the system supports users with a permanent

navigation assistant. Every interaction with the system is made using a normal Web browser, which turn the system more familiar for a user that already have some experience with the World Wide Web.

### *Functional description*

#### Entrance in the System

A Web page allows validating users registered in the system or access to the registration form. When a user accesses the system main page for the first time, appears a small form for its login. After placing the respective identification and entrance password, that was it supplied by the system administrator or from the system automatic registration processing, the user enters in the system.

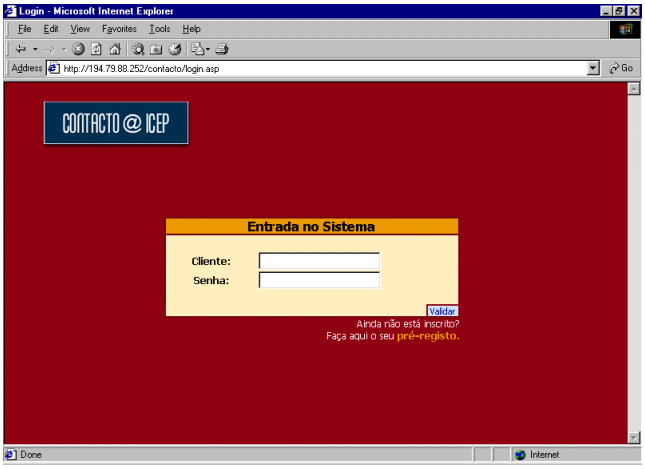


Figure 1: *EFTWeb* access page

In the case of not being registered in the system, a user cannot access to the registration area to place its personal data and to submit the registration request. Beside the administration it is possible to accept or not the requested registration. In the case of being accepted, and if the address of electronic mail has been filled, the user receives the identification login and entrance password together with a welcome text.

#### Initial registration

This service allows a user to request an entrance login and password in the system. After having filled a form with identification data, the user receives in its electronic mail box the login and the password to access the system. The user can later alter its personal data.

So, with a valid initial registration, the user must fill the fields of the name and electronic mail address. Other elements to fill are optional and can be later introduced by the user and / or by the system administration.

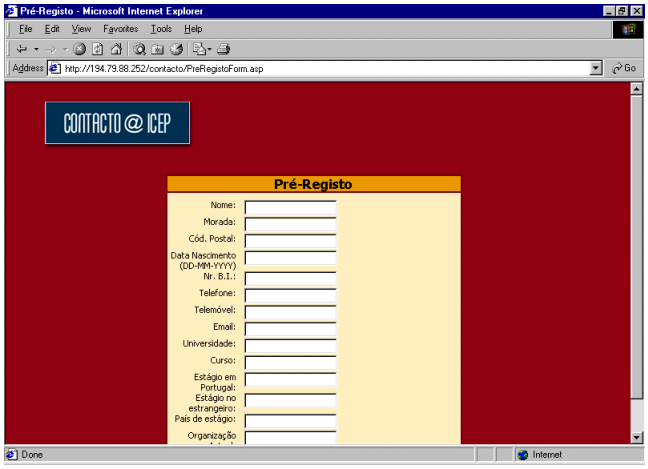


Figure 2: User data form for registration

## Personal area

The personal area works as the home page of the system. This page is the mirror of all the available services in *EFTWeb*. This looks like a portal but just for contents and services of the *EFTWeb* system.

The main page is divided in four zones:

1. Upper left for the company logotype and context operation of the system;
2. Left side with a descriptive menu of the available services in the system;
3. The superior bar with an alternative menu for the services, to allow direct access. Contain also information about the user profile;
4. The central work zone, where the information will be available.

In the personal area, a set of inside available boxes is displayed with useful information to the user. It is visible a list with the guides in which the user is registered and the last messages received by the internal system of electronic mail. Also, they are displayed the last added guides, units and contents stored in the *EFTWeb* system.

It is possible to identify new functionality to place in the boxes of information. The menu on the left side grows as new services are implemented, just as the superior bar.

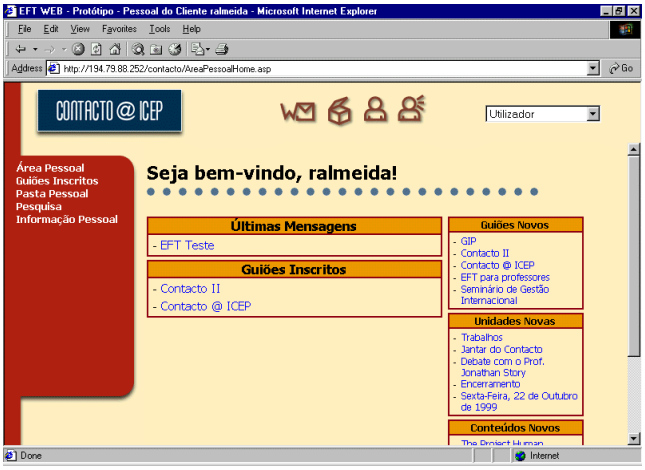


Figure 3: The personal area page with its four display areas

## Registered Guides

Each guide defines a "knowledge highway" available, in which the content of *EFTWeb* can be acquired by a user. A guide can be a group of contents, of courses, of seminars or a mixture of events and contents.

The guide is structured as a group of Units and / or Contents. A Guide can still contain other Guides, in the perspective of information reuse. As it will be described in the service of Maintenance in larger detail, a Guide can be built with any structure of available information in the Web site. In the menu option of registered guides, the user has access to the list of Guides in that is registered.

To register in a Guide, in the right menu, the user has the registration option in a guide, where they appear all the available guides in *EFTWeb*.

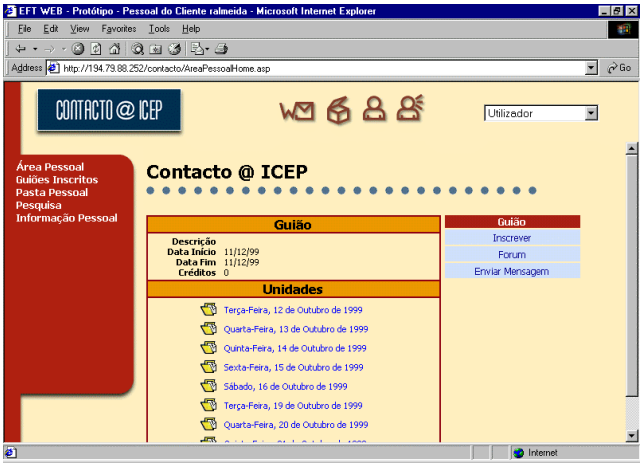


Figure 4: Page displaying guide contents (units and / or contents)

## Personal folder

The Personal Folder corresponds to a place where each user can place its personal documents with the possibility of sharing them with other users. The personal folder is divided in three zones:

1. Personal user folder - list of documents inserted in the system by the user;
2. Shared folders - lists of folders shared with other users;
3. Shared documents - list of documents shared with other users.

The available options in the service are:

- To add Document: include a document in the system;
- To edit Document: alter or delete a document;
- To remove Document: eliminate the document of the system;
- To share Personal Folder: give permission to other users to access the personal folder.

To share a document, it is necessary make its selection and use the option of sharing document. For the visualisation of a document, it is necessary make his selection and double clicking its respective name for opening it.

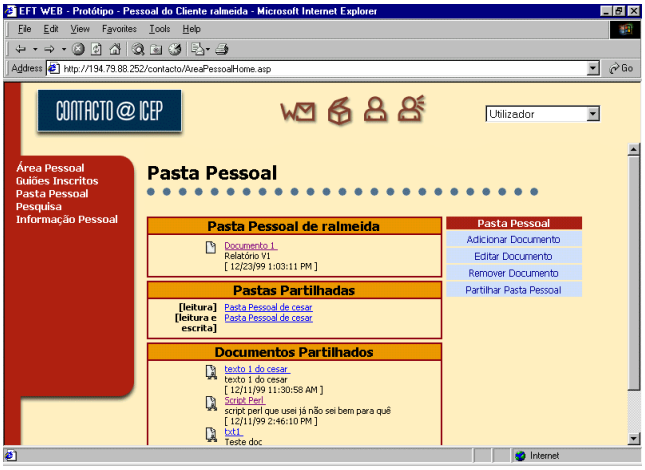


Figure 5: Documents and folders sharing in a personal folder

## Search

There are two possible ways to perform a search in the *EFTWeb* system: by textual search and using a thesaurus directory like search.

The textual search embraces the whole site information base, in that the result is given as a list with the asked information. The thesaurus search is presented as a navigation tree (thematic

directory) in that the information is classified in the branches, for terms previously introduced. The whole navigation tree is visible in the right menu.

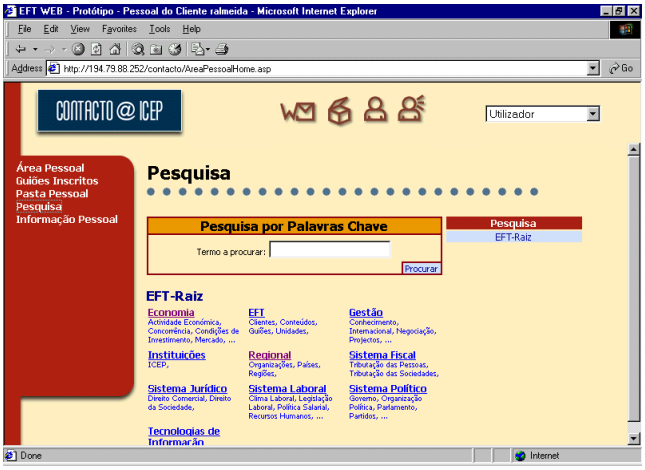


Figure 6: Textual and Thesaurus search interface

## Personal information

The user can alter the personal information, with exception to the identification in the system (login).

## Mail

As one of the additional services of *EFTWeb*, was identified an internal electronic mail in way to give answer to the need of maintaining the asynchronous communication among users. All the system users have access to a mail address. However, the mail system is limited to the system. This way, just using the routing facility to use normal electronic mail systems allows the use of a normal electronic mail address to sent/receive messages from/to outside the system. This service does not intend to substitute a normal electronic mail service, but allow the operation of an internal system of messages to *EFTWeb*.

In the system it is possible to accomplish the following operations:

- See a message: visualising its content;
- Write a message: introduce and edit the text of the message;
- Answer a message: interpreting the address and routing the message;
- Delete a message: eliminate an existent message.

### Dialogue

One of the more used systems in the Web for the conversation among people is the chat. This system allows the conversation in textual mode on real time in synchronous way. In the case of *EFTWeb*, the chat is divided in rooms, which can be configured in the maintenance service. Each room corresponds to an isolated area of communication.

The chat system possesses additional functionality as text colour control and fonts use, and user to user conversation. Also an historic record of the conversations can be done for the current session (room).

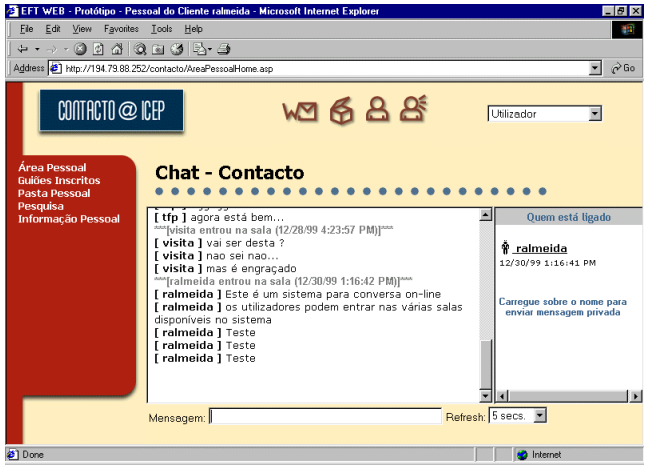


Figure 7: The chat service for *EFTWeb*

### User Profiles

The main security mechanisms in the system are the user profiles. Depending on the profile of the user, the list in the right superior menu is updated and options made available. This way, the functionality of the system is isolated of the user that will just have visible in its *EFTWeb* pages the functionality allowed by its profile.

### ***Maintenance***

The information and available structures in *EFTWeb* are maintained through dynamic pages developed to integrate user interaction and the system database. This way, after being performed each maintenance operation, its effect is rebounded immediately in the system.

### Users

Users can be altered, eliminated or updated. It can be defined the access profile as well as the associated credits. The initial registration validation belongs to this option.

The user can alter the personal information, with exception to the entrance identification in the system (login).

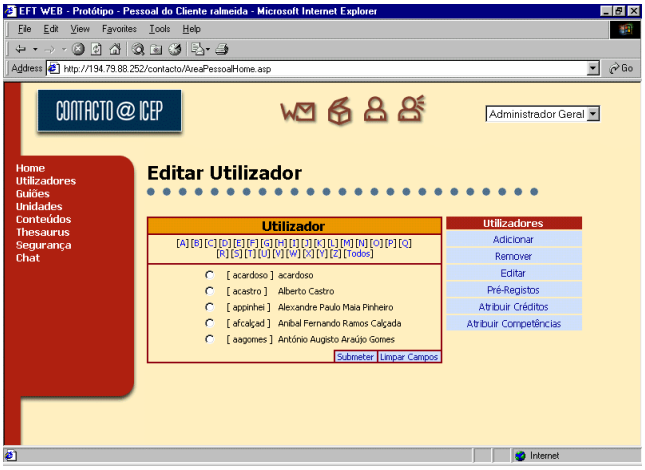


Figure 8: Users maintenance page

## Guides

The guide's maintenance allows the creation, updating and removal of a guide. It is also allowed to define the order of the guide and the objects included in the guide

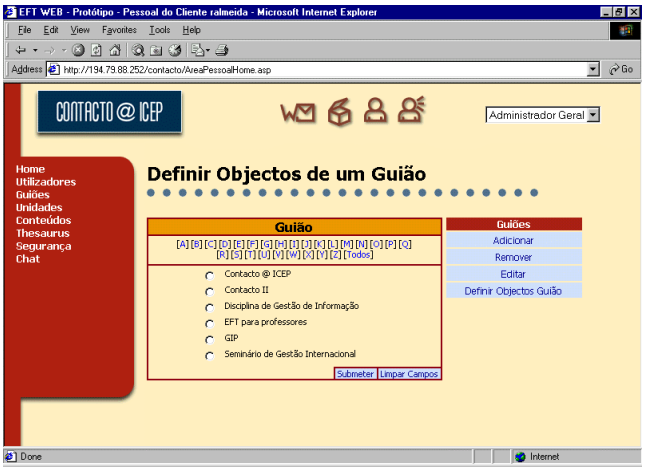


Figure 9: Guides maintenance page

## Units

In the units maintenance we have the following options: add, remove and edit. It is possible to define objects from the units.

## Contents

In the option for content maintenance it is possible to add, edit and remove a given content. The content catalogue allows associating the contents to the Thesaurus.

## Thesaurus

The thesaurus is classification system composed by three parts: the information to classify the classification structure and catalogue with the classified information.

The information can assume different forms and formats, such as documents, images, video, and sounds, among others. The information is the object on which a superior level of knowledge is built. This construction is accomplished by specifying its characteristics that they allow to associate a classification, useful when one hopes to obtain specific and fast answers on a certain source of information (information need). The classification is represented by terms that allow identifying meta-information. The classification structure enumerates and relates concepts. It is possible to have several structures of this way type to supply several alternative perspectives of the information. The catalogue contains the classification of the documents in agreement with the classification structure, relating documents with the meta-information that classifies them.

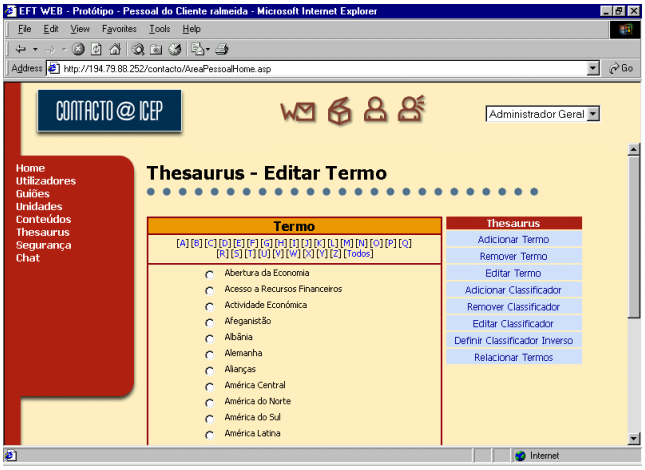


Figure 10: The thesaurus maintenance page

## System Security

The security maintenance allows the definition of the functions, which correspond to all the operations that a user can execute in *EFTWeb*. The complete set of authorised function defines the user competence.

The user competence allows containing functions for EFT objects. This way, the effort of creation of security policies is minimised, in the *EFTWeb* system.


Figure 11: System security maintenance page

### Dialogue among users (chat service)

The maintenance of the chat service is limited to the creation or removal of rooms for chat. A room can define a particular group of users or a specific theme or subject under discussion. The *EFTWeb* chat service allows synchronous multiple users discussions in text mode.

## *CONCLUSIONS*

This first phase of *EFTWeb* had as explicit goal to develop a work place to test the proposed framework. The most significant functionality was implemented that allow users to find the contents of the sessions of a given course, in the multiple forms in that they are available - text, sound and image. Access to previous sessions and works elaborated in another editions of the course is added to the possibility of development of the works to accomplish during the apprenticeship phase that the students must accomplish.

The *EFTWeb* interface was developed to be the simplest and intuitive possible in that all the options of the visualised menu are available, driving to an atmosphere of Web navigation, easy to use and that supports context finding. This atmosphere was created with the goal of allowing maximum usability for the *EFTWeb* system, turning it in an effective and efficient work tool for students and tutors use. The concept of the shared folder allows the joint development work between users with the tutor supervision, providing the means for each user is into different locations.

The *EFTWeb* system still presents much other functionality that only with elapsing of the experience with the users will be tested and of which will result very probably new ideas for the improvement of the system.

Thus, in the immediate future it is to test the system functionality and to evaluate in that measured some of those functionality should be or not maintained in operation in detriment of another that come him to verify more significant for the goals defined for this system.

Another action to develop in a close future has to do with the definition of the formats for the contents to introduce in the system, including sound and video facilities. The work in the definition and normalisation of the materials for the construction of the contents will be also very dependent of the experience due to this first test phase.

Among the future developments that this system should include, a very special attention should be given to the contents and as consequence to their definition and normalisation. A given producer should obey to a specific line of conception and production of contents? Is that need and could stimulate users to consult the information base and, in turn, fostering the preparation of new materials to feed the system? The system, by itself, should drive to a growing need of always producing contents with a quality and growing interest.

The potentiality of *EFTWeb* as an infrastructure to offering contents for teaching, training and learning allow to innovation in the teaching processes, contents reuse, maximise the creation, production and distribution of contents, by providing the conditions for the creation of a knowledge network.

With the use and experience of the *EFTWeb* system, many will be the improvements and new services that can be implemented. Its open and flexible design is prepared to allow future evolution in agreement with the needs felt by users and that of a strategic analysis of the institution who uses the system.

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