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EFT*Web*: Providing Context Sharing For Web-Based Learning

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ABSTRACT

The EFTWeb is a World Wide Web based system that allows the interaction between users and contents. The users can be students and teachers that place, modify and use available contents. The system provides the means to control security, intellectual property rights (ipr), and billing issues, giving both type of users the necessary tools to access the system, prepare materials and use them. One important facility associated with the system is its ability to create contexts. The creation of context is made possible by the combined use of thesaurus technology and referencing content by recurring to dynamic catalogues. The paper defends the importance that context may have when providing usable environments to support education, learning and training activities.

INTRODUCTION

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 being considered both as producers and consumers.

The system aim is to support with maximum flexibility both teachers and students and treat them as clients that produce, share and consume contents organized by well known sequences that can be customized according to different situations regarding the context of education, learning and training.

The paper presents the system with a focus on the creation of contexts and how they provide a real support for both teachers and students work. The paper will attempt to demonstrate the role that the use of context creation facility can have to structure information about a knowledge theme and thus provide users with a better service to support education, training and learning activities.

The digital economy obeys to very different paradigms from the traditional ones. Among interesting characteristics in the Society of Information is the possibility, with great easiness, to start from 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 education, training and learning.

Rethinking education, training and learning is crucial. It can be seen as a group of services, in a perspective of the demand to 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 who are information and knowledge buyers. But they also can be seen as knowledge builders!

EDUCATION, TRAINING AND LEARNING IN THE WEB

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

However, education, learning and training is on move despite presential teaching almost remains the same for the last four centuries [1]. Even, with current available information technologies and its impact, no relevant changes are in sight. Due to the tension between what can be expected by students and current educational offer is greater as shown by each day new signs of the growing difference between what students want and what society needs and what institutions can provide. Even teachers seems somewhere lost by the pace of change and by the lack of interest among students to attend, discuss, and produce work in a traditional education environment.

Opportunities to take advantage of information technologies in educational contexts are reported by several authors: [2] and [3]. In particular, there is an opportunity to innovate by reinventing time and space constraints in educational settings [4] and introducing computer and network support on presence teaching [5].

However, the use of Information and Communication Technology (ICT for short) generally does not introduce innovation into educational practices although they offer tremendous opportunities for that [6]. Among these ICT offerings, are the use of laptop computers, PDAs, network support and the Internet itself.

EFT*WEB* SYSTEM PROPOSAL

Basic Model Concepts

The EFTWeb system proposes an innovation of the education, training and learning process, through the use of the Web by presenting a framework that bases teacher and students interaction on the materials and tasks to be accomplish. In the proposed model, content has the same importance as the means for classifying it [7].

The EFTWeb model was designed to support three main concepts for content structuring - unit, theme and content. A unit possesses themes and for them corresponds presential sessions or module units. Each theme has a group of contents that aids information and knowledge transmission. A *content* is an independent object of a given format, among the many multimedia formats supported by the Internet.

The organization scheme for user access, unit - theme - content, is given by the notion of a guide. A well-defined sequence of the referred elements is associated to structure contents and gives to the user a path to explore information [8].

One of the underlying ideas for EFTWeb is to support with maximum flexibility content access by giving total permission to use available resources and facilities. This is implemented by assigning a particular profile to each user. To support it the model implements a credit based system allowing each user the access to a given resource based on a cost for each unit retrieved. Each user receives a given amount of credits that can use with some degree of freedom. The EFTWeb user can be an individual or a group of individuals like a class. A user can be any teacher or student.

An important model characteristic is considering each user a client. The model allows the necessary flexibility to consider users as potential consumers and producers. This way, the system provides

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support to organize student's works and integrate them in the content offering by appropriate control of author rights and content's versioning and certification. It also allows teachers to build along with content, new or existing guides based on others work. This can include, in all or partly, already existent guides. This user can also introduce enhancements in the way content is classified.

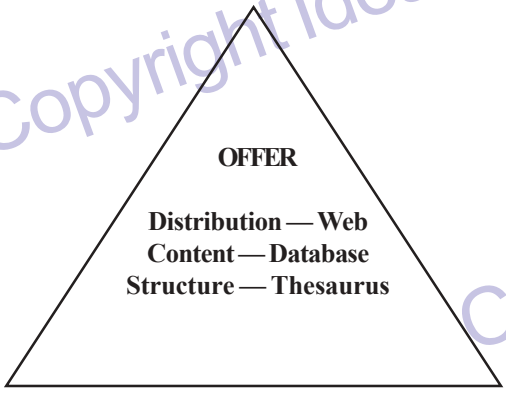
Technology Support

The EFTWeb model is implemented with available widespread technology. To support content distribution, World Wide Web becomes the natural solution. It has a lot of information available that needs to be mediated for being trusted. Also, its information can be searchable and exists in a digital format, in particular using a textual search engine. Web access is possible with a personal computer and its cost is acceptable.

To support content, database technology is used. This technology eases the storage and retrieval of contents and supports multiple and concurrent accesses supporting multimedia storage and logs activity. It also provides proven means for search and dynamic maintenance of contents and model data structures.

To support semantic structures, where relations between contents are of importance, thesaurus technology is used. This will provide the necessary flexibility to access content by using a set of ordered concepts that allows to store, with each content, independent semantic and high order relationships.

Figure 1: The offer in the EFTWeb model



The combined use of World Wide Web, databases and thesaurus technologies are designed as the support for the system offer - distribution plus content plus structure - and constitutes the system core added value. Figure 1 represents the model offer. A number of systems already take this approach as the case of some intranet models [9] and education specific models as WebCT and other. A comparison of the EFTWeb with a number of education models (Aulanet, Classnet, Learning space, Live/Books, Serf, Virtual-U, WCB, and WebCT) is made in [10]. One of EFTWeb main distinction is its reliance on the thesaurus technology to introduce structure on the model.

One of the more relevant features of this model is the use of thesaurus technology to structure content semantics. The thesaurus is used to describe a particular model of knowledge about a given area in terms of keywords and relations between these keywords. The system allows the creation of several different structures in the thesaurus, for different overlapping classification systems to use at the same time.

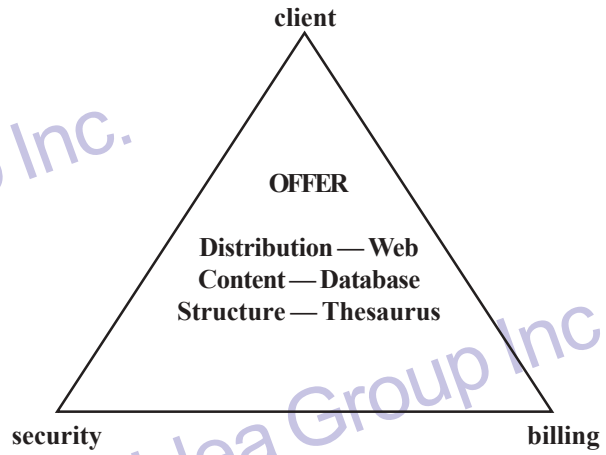
From the user perspective, the Web browser integrates system functionality by offering a common and easy to use hypermedia interface. This option allows for the technology integration without increasing user client complexity to configure and use. Its use also allows integration with Internet and Intranet existent facilities.

Model Entities

EFTWeb model considers in its core some support for security and billing issues. The entities represent the interface with external issues like client, security, and billing (figure 2). These three entities were selected in order to provide a clear business orientation for the EFTWeb model

- *client*: includes teachers and students. The model allows a client to be a consumer and also a producer;
- *security*: deals with the need of protecting client identification and client system use. Also included user operations allowed and what can the user really do, modify, comment and add as content and context information;
- *billing*: allow the necessary arrangements to use the system in a commercial way, where different types of promotions, paying education, learning and training programs, and fees can be applied.

Figure 2: The entities in the EFTWeb



Model Mechanisms

The model mechanisms are used to interface the offer with the entities presented. The mechanisms receive the information from corresponding entities and provide the processes and storage needs to deal with entity requirements in a flexible and independent way.

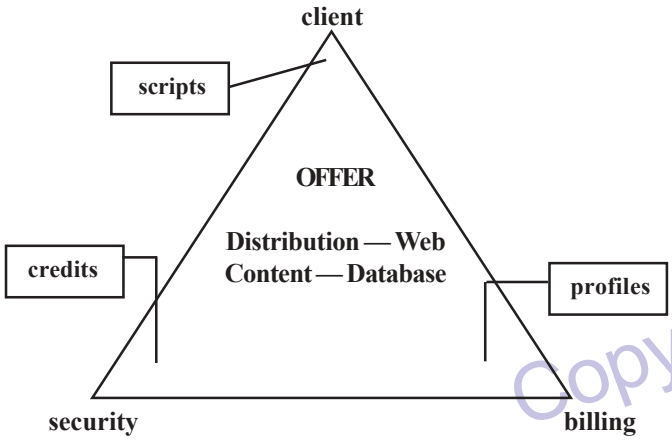
For each entity, the model offers a correspondent mechanism that acts like a system translator between each entity requirements and the functioning for system offer integration. The model mechanisms are defined as (figure 3):

- *scripts*: having the distribution, content and structure as an organized and available offer, to each client can correspond a particular path that shows a set of selected offer;
- *profiles*: corresponds to how each client can interact with the offer, by allowing different levels of functionality to take place. These levels are described as use, read, execute, comment, add, certify and evaluate;
- *credits*: allowing client' interaction with the offer in a cost based approach. Each action concerning content or each kind of interaction can have a particular cost or be rewarded with credits. Credits also allow system usage regulation by controlling accesses. The credits mechanism interacts with the billing by allowing an internal unifying cost for tracking usage and a commercial independent pricing.

EFTWeb User Types

Three types of users should be considered. The normal user can be a teacher or a student. The administrative users are responsible for the normal definition of the system offer and operation. There are two types of administrative users: the ones that deal with the base offer definitions and the thesaurus administrative users that are responsible for maintaining multiple catalogues and thesaurus.

Figure 3: The mechanisms in the EFTWeb model



The model also proposes two types of services: administrative services that allow administrative users and thesaurus administrative users to enter the information necessary to the system operation, like user information, content and structure information. The administrative services are:

- *certifying and authoring*: certifying contents and authoring scripts;
- *version control*: promoting and maintain related content collections;
- *catalogue creation*: complementing the thesaurus with additional information by introducing lists of available thesaurus keywords with correspondent weighting factors.

Notice that although these services were design to be performed by different people, anyone can be part of each group and each group will not excludes members from the other groups. The three groups were devised in order to reinforce content quality and its categorization effort.

System Services

The system takes advantage of existent world wide and low cost web facilities. It is based on a client / server architecture where the core content is stored in a database and all the interaction between the system and users is made by a web browser using standard facilities (no plug-ins). This means that no additional plug-in for running EFTWeb is needed, although any format used for content support may require plug-ins to be presented. That's the case for, among others, content produced using Flash or VRML code.

The novelty is on the model used to create the database structure, where focus was directed to clients, security and cost supervision. In order to fill these requirements, some integration mechanisms have been developed. In the system core, contents classification (metadata) based on thesaurus technology is placed along with the contents, allowing great flexibility in the terms definition.

The EFTWeb can be used as broker to assist both teacher and students needs by providing content in context. Different educational contexts can be envisaged as resulting from presence education support, distance education, and training or even instruction activities.

The current EFTWeb version supports several services including the use of a recommender system and the support for co-operative work for tracking document and folder sharing (version management). These facilities along with the more usual electronic mail, news, forum and chat provide a set of services integrated with the content database and a thesaurus based content classification for access and search available content. Users can also trade content by using credits to buy and sell contents. Security issues are implemented in the base system in order to certify who is doing what respecting a given content.

The implemented user services are [8]: *mail*: each client must have access an email address to send/receive messages; *dialog*: allow client chat in real time. The service is organized in rooms that groups users by topic; *personal area*: works as a system portal, proposing a link collection; *personal folder*: the place where the client place his documents with the option to share them; *search engine*: available in two modes †textual search and thesaurus (by directory); and *guides*: this facility defines the content sequence †"*knowledge road*" †to be used. It groups other guides, units, and content.

IMPACT ON EDUCATION, LEARNING AND TRAINING

Considering current education, learning and training processes, the ones that are proposed by EFTWeb favored content reuse by allowing its combination based on existing context creation facilities. These facilities are implemented by the creation of a thesaurus and its flexibility based on alternative catalogues for each context †thus allowing alternative models to user access content. These models can exist and be used at the same time for different users and be replaced at any time for each user, providing alternative contexts to access content. Four types of activities in the process of education, learning and training can be proposed as follows:

- *lecturing*: the activity of content transmission and facilitation;
- *certifying*: the activity of validating contents and education contexts;
- *evaluating*: validate and assess client (both teachers and students) knowledge
- *production*: the activity of content creation, methodology elaboration and technology selection.

Considering the above activities, are proposed three main education types: *lecturing*: actions that involve one individual responsible for knowledge transmission to an audience composed by group of individuals that may have different goals; *training*: actions oriented to the content, where the intended audience have common and well defined goals; and *instruction*: actions oriented to the context, where the intended audience has a well know profile and a group of tasks to be executed.

From these definitions (activities and education types) two important issues arise. First, there is a need to deal with the available resources in a flexible way †specially the ones concerned with content. Second, allow combining types and education activities for extending and describe resources as contents and contexts in the EFTWeb perspective.

EFTWeb proposes a model to support the need to store, represent and maintain both contents and semantic of contents in order to allow contents relations in an independent and not previous known ways. This characteristic allows context support along with contents also with semantic support given by using thesaurus technology.

THE USE OF THESAURUS

The current proposal for using thesaurus technology allow to provide a high level description of the context and meaning of specific works within the knowledge domain where the available model offer is to be used (distribution + content + structure).

As the use of thesaurus allows the specification of meanings for the more important words used for classification, and search and browse tactics [11]. In conjunction with the use of catalogues, the thesaurus facility allow a group of users to construct and develop a context where they can both explore available content and create a high level description of the knowledge domain to be used.

Such a system is integrated with the available content by the use of a textual search engine. It takes advantage of the specified thesaurus keywords and the provided catalogue weights for these keywords, to build queries and to retrieve content that matches with these weighted keywords by using not an existing content classification, but the content description itself.

The use of thesaurus and catalogues allow students to reasoning not only for how to select content but also to develop the context

within those content is select. It provides a means for organizing available content and provide a tool for information management and to organize information about a given knowledge domain.

CONCLUSIONS

EFT*Web* provides the support for education, learning and training activities based on the following advantages:

- *flexibility*: concerning the production process. The production includes contents, thesaurus and guides;
- *diversification*: by means of reusing existent content in new guides (contexts) and upgrading them both with new contents or by improving existent ones;
- *differentiation* at the product level, by offering content and guides for satisfying each client needs.

EFWeb can be of help in the emerging of new approaches to the education business not only by supporting but also for packaging contents and facilitate its management. Central to EFTWeb use is the creation of thesaurus and guides who turn easy context descriptions for client needs fulfillment. These contexts allow taking advantage of existing content in different perspectives with different goals and within various activities.

The creation of multiple catalogues to be used with each of thesaurus definition provides an even richer context description by allowing the use of the language and each area glossary to be integrated with EFTWeb facilities to browse available content. Beyond content and its reuse is the context offering to support education, learning and training activities.

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