Using a content management approach to support Web-based learning

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Abstract

EFTWeb proposes an approach to unify educational materials – contents – and their operation under education, learning and training activities. The proposed model allows content reuse no matter is produced by teachers or students. It also offers an open collection of educational material to be explored. As a complement, it provides a structured approach to the educational materials storage as usable content. The use of thesaurus facilities allow for the creation of alternative contexts where content can be used meaningfully within different perspectives. More traditional forms of content classification such as the use of metadata or content classification strategies offer a limited perspective on what was the content creation aim or the context where classification takes place. If we can, based on learning needs, specify a given knowledge topic using a high abstract description level instead of relying in same previous classification, a much wider potential use of available content can be expected. The paper proposes a model to enable such a content management approach.

Keywords: web-based learning, content management, e-learning

1. Introduction

The EFTWeb results from research efforts concerning the lack of integrated solutions to reuse the contents generated ongoing by teachers and students from each discipline. System functionality is extended in order to make possible content reuse between different disciplines from different teachers and within different educational situations. EFTWeb supports Education, Learning and Training, taking advantage of existing Web facilities. In the proposed system, teachers and students are treated as clients. These clients can choose a profile, use credits they have acquired, and be certified as content producers. The EFTWeb implementation has several integrated services: webmail, chat, recommender system, and document sharing providing a platform used to test the EFTWeb model ideas. A browser interfaces these services as well as the access to on-line information for both presence and distance learning.

The developed 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).

As the novelty is on the model used to create the database structure, whose focus was directed to clients, security and cost supervision, this paper is focused on the model concepts. The discussion of existent cases studies and current uses are presented in [Borges Gouveia et al., 2000], and a comparison with other well known web based learning platforms is provided by [Gouveia et al., 2000a]. In order to fulfil security and cost requirements, some integration mechanisms have been developed. In the system core, contents classification based on thesaurus technology is placed along with the contents, allowing great flexibility for classifying and searching. This approach also allows the creation of context description of a given knowledge topic as it can be used to inform a textual search engine and thus provide integration with available content by providing a selected set of terms / words that can be related with a given topic, a particular content or need.

The EFTWeb takes advantage of being a web-based system and it attempts to address both the requirements of presence and distance education. For presence education use, EFTWeb deals with the content management issues of relating contents allowing their reuse. In distance education it extends those facilities providing the means for synchronous and asynchronous interaction between users (students and tutors) and allowing them to share content. Additionally, by providing a semantic description for content (the thesaurus use) as a strategy for content management, an extra level of flexibility is provided for use in many forms of education and learning and to support those who have strong reuse content requirements.

Nowadays, rethinking education, training and learning is crucial. One perspective is to consider these activities 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. It is important to state that, more and more, students are seen as customers and also as information and knowledge buyers. Why not to consider them also as knowledge builders? To address this, a different approach concerning their production as papers, essays, and other work must be considered. A model taking into account a content management approach is proposed in the following sections. The paper presents the EFTWeb model concepts and explains how they are integrated to allow content reuse.

2. Towards a content management approach to education, learning and training

Taking into consideration current education, learning and training processes, EFTWeb stresses 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 allowing alternative contexts to access content. These contexts can exist and be used at the same time for different users and be replaced at any time for each user, providing alternative support to access content.

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 different education activities for extending and explicitly describe resources as contents and as contexts.

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.

2.1 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. Despite presential teaching almost remains the same for the last four centuries [Puttnam, 1996], with current available information technologies and its impact each day new signs can be seen 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 settings are reported by several authors, as described by Harasim: [Harasim, 1995] and Papert [Papert, 1993]. In particular, there is an opportunity to innovate by reinventing time and space constraints in educational settings [Gouveia, 1999] and introducing computer and network support on presence teaching [Gouveia, 1998].

However, the use of Information and Communication Technology (ICT) generally does not introduce innovation into educational practices although they offer tremendous opportunities for that [Goodyear, 1999]. The following section introduces the EFTWeb proposal to foster content reuse considering education, training and learning needs.

3. EFT*Web* system proposal

3.1 Basic model concepts

The EFTWeb system tries to innovate education, training and learning processes, 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 than the means for classifying it [Gouveia et al., 2000].

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 unit is an independent object of a given format, among the many multimedia currently available and supported by the World Wide Web.

The organisation scheme for user access (unit, theme, content) is given by the notion of a guide. A well-defined sequence of the above elements is associated to structure contents and gives to the user a path to explore and organise information [Borges Gouveia et al., 2000].

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 retrieved content unit. 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. An individual user can be a tutor or a student.

Another EFTWeb characteristic is considering any user as a client. The model allows the necessary flexibility to consider users as potential consumers and producers. This way, the system provides support to organise student's work 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. The user can also introduce enhancements in the way content is organised.

3.2 The OFFER concept

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 standard software which turns its cost acceptable.

To support content, database technology is used. This technology eases the storage and retrieval of contents and allows 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.

OFFER

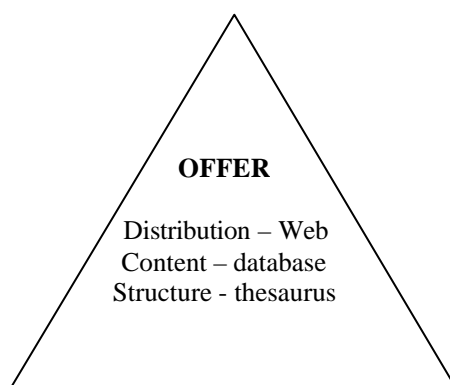Distribution – Web
Content – database
Structure - thesaurus

Figure 1 – The offer concept within 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 offer concept.

One of the more relevant features of this model is the use of thesaurus technology to structure content related 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 current Internet and Intranet facilities.

3.3 The EFTWeb entities

The EFTWeb model considers in its core the 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 includes user operations allowed, and permissions for what a user can do, modify, comment and add as content and context;
- ? *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.
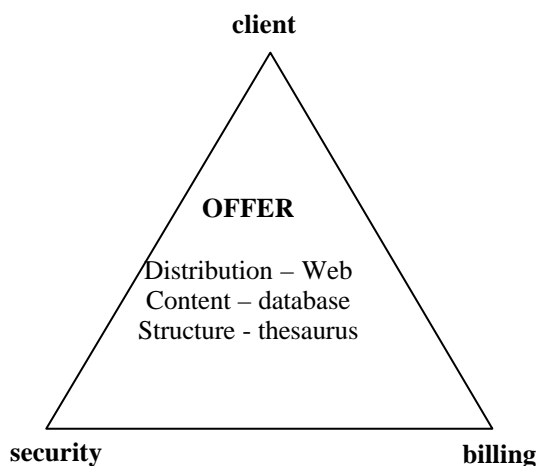
client

OFFER

Distribution – Web
Content – database
Structure - thesaurus

security   **billing**

Figure 2 – The EFTWeb entities

3.4 EFTWeb mechanisms

The model mechanisms interface the offer and EFTWeb entities. The mechanisms receive the information from corresponding entities and deal with the processes and storage needs 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 (figure 3):

- ? *scripts*: considering the distribution, content and structure issues as an organised and available offer. To each client can correspond a particular path that shows a set of selected offer customised for its own needs;

?   *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 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.
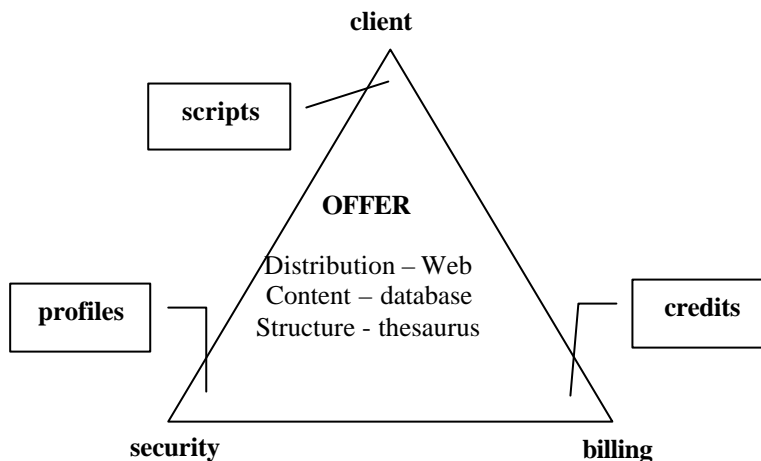

Figure 3 – EFTWeb mechanisms

3.5 EFTWeb services

The model proposes two types of services: administrative services that allow users to enter the information necessary for system operation, such as user information, content and structure information; and regular services for system operation.

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.

The EFTWeb can be used as broker to assist both teacher and students needs by providing content within specified contexts. Different educational contexts can be envisaged as resulting from learning needs or from different educational settings as presence education, distance education, and training 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 (supporting version management). These facilities along with the more usual electronic mail,

news, forum and chat systems provide a set of services integrated with the content database and a thesaurus based content organisation for accessing information. Users can also trade content by using credits to buy and sell contents. Security issues are implemented in the system core in order to certify who and what is doing, for each particular content occurrence.

The implemented user services are [Borges Gouveia et al., 2000]:
- ? *mail*: each client must have access an email address to send/receive messages;
- ? *dialog*: allow client chat in real time. The service is organised 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 for textual search and thesaurus search (by directory);
- ? *guides*: defining the content sequence (*knowledge road*) to be used. It groups available guides, units, and content.

4. Used devices to produce context

To describe a given context, EFTWeb uses its thesaurus and catalogue facilities. The thesaurus provides the structure support for content reference. The catalogue allows to leverage the use of thesaurus both by providing equivalent terms to refer a given context wording and to add extra semantic to the one provided by the thesaurus.

For example, for a thesaurus entry, named *client*, we can have different associations with alternative catalogues. One such catalogue can be used to describe a Medical Care context as *patient*. Another one can be a Government context where we have *client* related with *citizen*, or considering a School Context we may have *student*.

The creation of additional extensions for existing structures (provided by thesaurus) can be obtained using catalogues. This approach follows the use of Concept Maps and implements it as a set of catalogue terms. Concept Maps provide context information and the high level meaning to a specific situation or approach [McAleese, 1999] and thus allows existing content to be found using a textual search or, alternatively, taking advantage of existing content classification using the catalogue terms, more close to a particular user context, and taking advantage of its association to thesaurus entries. A more detailed discussion of the thesaurus and catalogues use is provided by [Gouveia and Borges Gouveia, 2002].

5. Conclusions

EFTWeb proposes a system that unifies contents and their operation under education, learning and training activities. This will allow content reuse from and by teachers and students. It also provides a structured approach to storage educational materials produced (content).

The use of thesaurus facilities allow for the creation of alternative contexts where content can be used and referred within different perspectives. Traditional forms of content classification offer a limited perspective based on what where the content creation aim and place restrictions in content organisation.

If we can, based on learning needs, specify a given knowledge topic using a high abstract level description instead of relying in same previous content classification, a much wider potential use for available content can be expected leading to its reuse and potentially impact their ongoing quality.

Also, as a main concern when dealing with information overload problems, any environment that follows a reuse strategy for available content seems to be a valid path for research as it follows pedagogical needs concerning the training of using available information and take advantage of current efforts to enhance and further extend (reuse) it.

A key issue when discussing such models regarding the open and distance learning support are their pedagogical bias. The majority get stuck in a particular pedagogical approach and demands for users, learning and educational strategies to conform to the particular approach followed. One of the most important facilities given by the EFTWeb model is not proposing a particular pedagogical approach but the content management approach who provides the tool to use and compose alternative pedagogical approaches, based on content reuse and on the construction of the thesaurus and catalogue instances – thus provides even a higher order of content reuse – the possibility to reuse content from different pedagogical approaches.

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