Proposing a knowledge policy based on the EFT*Web* model

Luis Gouveia, Joaquim Borges Gouveia
lmbg@ufp.pt , bgouveia@egi.ua.pt

GIOTE Technology and Operations Innovation Group
Rua Teixeira Lopes, 96 - 4400-320 Vila Nova de Gaia, Portugal

Abstract
The EFT*Web* results from research efforts concerning the lack of integrated solutions to reuse the contents generated ongoing by teachers and students from each discipline. EFT*Web* supports Education, learning and training, taking advantage of existent 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. EFT*Web* has several integrated services: *webmail*, chat, *recommender* system, and document sharing. A browser interfaces these services as well as the access to on-line information for both presence and distance learning.
Supported by EFT*Web* facilities the authors defend content organisation and access as a service centre to support education, learning and training. The impact of such a model can open new ways to deal with knowledge and knowledge trade related with education, learning and training. It seems to be clear that new policies concerning knowledge are needed and this is discussed in the paper based on experience gathered with the EFT*Web* model.

Keywords
advanced network applications, web based learning environments, distance learning, knowledge management

1. Introduction

Education, learning and training is on move. Each day we see new signs of more difference between what students want, and what society needs and what institutions can do. Even the 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 (Puttnam, 1996).
Digital business characteristics 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 education, training and learning (Gouveia, 1999).
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. They can also be seen as information and knowledge buyers. But they also can be seen as knowledge builders!

2. Education, training and learning in the web

Education, learning and training constitutes one of the areas of great potential for innovation (Oravec, 1993). 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.

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 education, training and learning, mainly in what it concerns to the presential teaching.
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.
Opportunities to take advantage of information technologies in educational contexts are reported by several authors: (Harasim, 1995) and (Papert, 1993). In particular, there is an opportunity to innovate by reinventing time and space constraints in educational settings (Gouveia, 1999a) and also introducing computer and network support on presence teaching (Gouveia, 1998). There is a need to rethink existing processes.
However, the use of Information and Communication Technology (ICT for short) generally do not introduce innovation into educational practices although they offer tremendous opportunities for that (Goodyear, 1999).

3. EFTWeb system proposal

3.1 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 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 is an independent object of a given format, among the many multimedia available supported by Internet.
The organisation 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 give to the user a path to explore 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 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 support to organise 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. The user can also introduce enhancements in the way content is classified.
In particular the model was designed to allow the following functionality:

- *skills trading*: tracing where to find the right content offer for each specific situation of education, learning and training;

- *processes innovation*: where the normal settings for traditional situations of education, learning and training can be reengineered and its functioning supported by the system;
- *configuration flexibility*: allowing end users to configure the system for their needs;
- *contents reuse*: made available contents for reuse, maintaining its intellectual property rights and tracing version changes;
- *maximise benefits from content production and distribution*: allowing reuse and reference from different grouping units as disciplines, modules, or other forms of content clustering;
- *create the conditions to have an education business*: in particular of education contents and contexts. Made this possible by implementing a system with security considerations and some sort of mechanism that allocate to each user a number of credits that can be used and serve as pay credit for using the system.

The following subsections will describe the EFTWeb model, namely, its technology support, model entities, system user types and services.

3.2 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.

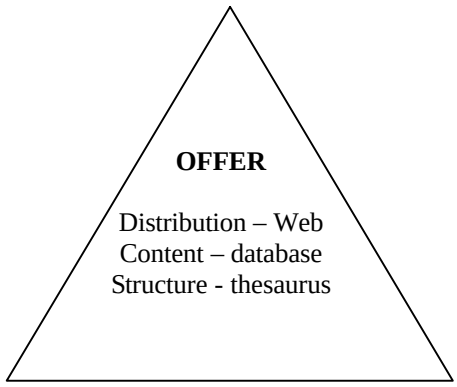

Figure 1. The offer in the EFTWeb model

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.

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.

3.3 Model entities

EFTWeb model considers in its core, provision for supporting 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.

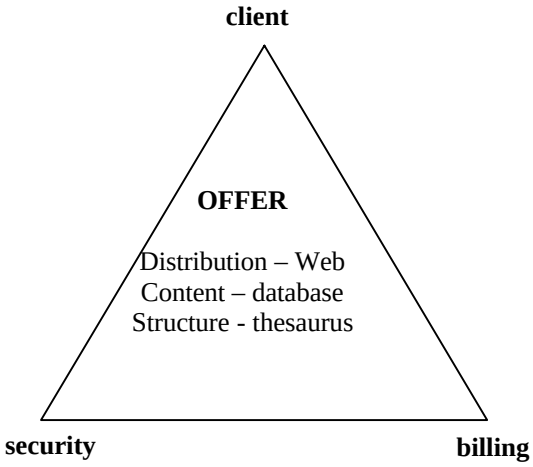

Figure 2. The entities in the EFTWeb

3.4 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 organised 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 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 interact with the billing by allowing an internal unifying cost for tracking usage and a commercial independent pricing.

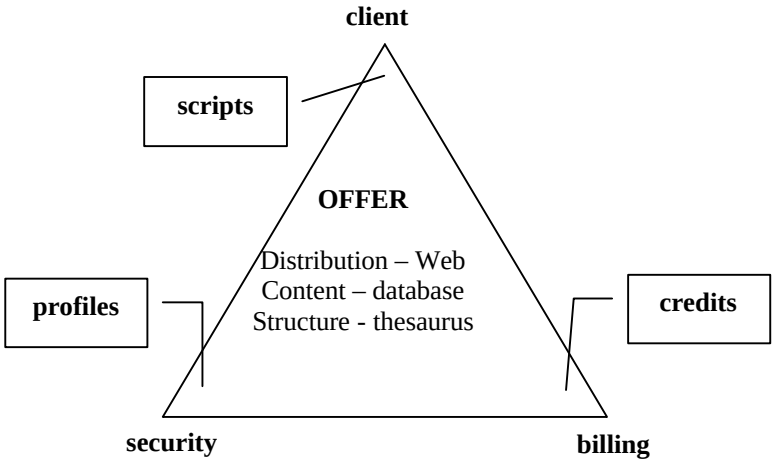

Figure 3. The mechanisms in the EFT*Web* model

3.5 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.

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.

Based on available user types, a strong correlation with user functions is made. This will allow to define a number of additional services that can be associated with each of the user types. Although each user can contribute with content and new guides to the system, just some must be responsible for system information.

3.6 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).

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.
Among the implemented user services the following are the more used and where reported in (Borges Gouveia, 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 in two modes textual search and thesaurus (by directory);
- *guides*: this facility defines the content sequence " *knowledge road*" to be used. It groups other guides, units, and content.

4. Impact on education, learning and training processes

Considering current education, learning and training processes, the ones that are proposed by EFTWeb favoured 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.
The EFTWeb model provides for education, training, and learning, a content management system, which allows information visibility and accountability.

4.1 EFTWeb allows an innovative knowledge policy

Today, there is a need to speed up responsiveness to satisfy market demands. The most pressing issue facing modern business is no longer about reducing manufacturing costs and making the highest-quality product. The issue is about delivering value to the customer what they want, when and where they want it, and at the lowest possible cost. A rapid, cost-effective and reliable demand fulfilment is needed to support this new value proposition (Kalakota and Robinson, 2001). Education, learning and training is no different, when considered as an e-business.
In order to better use of the proposed EFTWeb model, some concepts must be discussed. These concepts are the education *functions*, education *facilities*, and education *actions*. These concept will provide the basic ground for designing the policies to trade and take advantage of content and context based on the EFTWeb model. *Functions* provide the main activities in content and context creation. *Facilities* were related with the way we can manipulate information. Finally, *actions* provide the different ways were both functions and facilities can be used in education, learning and training.

By education *functions* we understand the four types of activities involved in the process of education, learning and training which they are:

- *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.

By education *facilities* we mean the three main groups of services that may be offered to a client of the model. They were already discussed when with the EFTWeb technology support (see figure 1):

- *distribution*: involving the communication, broadcasting, and exchange of system resources. It also, involves the security issues of using the system resources, by giving permissions, membership and resources allocation;
- *content*: this service includes the production, adaptation, and redesign of contents. It also include the format, codification and dimension issues used to register and represent content;
- *structure*: this service involves the creation of some order sequences to refer contents, and the criteria by which content is been organised. It includes the necessary arrangements to combine contents, structure them, and provide the means for content relationship.

Concerning education *actions*, they 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;
- *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 two important issues arise. First, there is a need to deal with the resources in a flexible way. Second, the resources are contents and contexts.
The EFTWeb model support the need to store, represent and maintain both contents and content semantic allowing content relations in an independent and not previous known ways. This is the system characteristic that allows context support along with contents. A current trial of the EFTWeb implementation is taken place in order to test how the system can be used for content management and education, learning and training support regarding a postgraduate environment.

5. Conclusions

EFTWeb proposes a system that unifies contents and their operation under education, learning and training activities. This will allow the necessary technology infrastructure for supporting a service centre for education, learning and training.

The authors defend that a system like this can have a strong impact in the way we organise education, learning and training activities. Mainly, it allows a content and context based organisation of education, learning and training activities centred in the user.

Knowledge policies must be designed accordingly to favoured both the learning and the return for all the players involved being teachers or students or even who support the education, learning and training activities. The income can be the learning itself or related business from the creation of the several EFTWeb ways of creating value.

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