E-learning Platforms - Towards an independent architecture

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ABSTRACT: *This paper is part of a large research project aiming at the implementation of an original distant learning platform, integrating advanced characteristics: SMART Learning (System for Multi-media Adaptive and coopeRative TeleLearning).*

The purpose of this paper is to present the methodology, which is adopted in the SMART Learning architecture, and focuses on the independence of the platform with respect to education systems. Indeed most of known platforms, use a specific approach, which do not adapt to learning actors and their own context and vocabulary. An education system represents the whole services given by a learning system. It includes the diploma to deliver, the courses and all the other resources related to the educational process.

1 INTRODUCTION

SMART Learning is an elearning platform project that aim to develop an asynchronous distant learning environment. The object of this project is to offer a complete platform, with advanced possibilities, in order to satisfy learner's needs in optimal conditions. Learners can be high school students, or enterprises employees having long life learning.

In most of the elearning platforms the asynchronous mode of training is adopted in order to permit to the learners, an access without space-time constraints. However, the users have to stick to a specific methodology owned by the platform editor. Whatever the originality and the interest of those methodologies, learner will be disturbed. For example, a learner trying to have a distant learning course that is part of a degree comprising other courses taught in traditional mode (presential) or on other platforms. The difference between his traditional mode and the platform methodologies will disturb the learning process.

To implement a distant learning platform with a large diffusion spectrum, according to multiple education systems and useable in various pedagogical conditions, we focus on some vital aspects. The independence of the system structure towards its users (learner, author, administrator and tutor) particularities lets it be flexible and self-adapting regarding the training environment. It's important for the platform to adapt to users specific terminology, according to their particular context.

The platform specification must adapt to known standards so as LTSA [4] and their extension in order to respect interoperability conditions between platforms.

Our goal is to supply the architecture of a distant learning platform with some advanced characteristics, in order to be highly independent towards most of environment conditions. We will first focus on fundamental architecture parameters that characterize a distant learning platform. This characteristics, includes adaptability, collaboration and independency. Then we will present SMART Learning architecture basis.

In the following we introduce, fundamental concepts of elearning platforms architecture, and their conformity with the standards.

2 DISTANT LEARNING SYSTEMS CHARACTERIZING

Emerging standards in distant learning do not focus on the methodological approach of the teaching standardization, nor the co-operation aspects between the actors. However these elements are fundamental in the training process. They ensure that the platform be accessible in various contexts.

Distant learning standardization must respond to the need of economic profitability of the investments and an improvement of the pedagogy effectiveness of its products.

Some motivations of implementing a distant learning platform with a broad diffusion were developed in works [1, 3]. In this paper we will complete and reinforce them, especially in the independency direction.

Accessibility- Independency towards environment: A training system should ensure users to be independent toward the communication support and its environment. Learners should have access to updated information, in a flexible and effective way. The system must allow in a distributed network, the activities of searching, identifying to the platform, the access and the delivery of the elearning contents and components. It should ensure the independence of the users with respect to the communication support (networks) and its environment. Internet is adequate today as a standard, in order to respond to this criterion.

Interoperability- Content independency towards platform: It allows exchange of contents and components between platforms and organizations. This means that content (courses developed and deployed on a platform) can easily be re-used on another platform and in another pedagogical context. This supposes for the platforms a high compatibility to the standards, at the structural level, and at the content implementation.

Main actual work of development deals with the metadata of content, the contents structuring, the systems architecture and the learner's information. SCORM is the main model for this purpose [8]. This model integrates the most important basic specifications.

Independence towards the education system*:* Usually, the education models development fits to the socio-cultural, local and regional environment of the learning actors (learners, authors and tutors). While changing education system (moving from Canadian system to French system, for example), we will find a difference in organization, in structures and in user's terminology. With judicious parameters setting up, the platform will permit education system re-defining.

Interoperability between education systems: In order to attend a course, that is part of a curriculum, a student needs some prerequisites defined by course author or by the education system. A prerequisite can be a diploma, a chapter or even a section of another course. Interoperability will ensure prerequisite formulation, from the background knowledge granted in a different platform, on education system characterized by another structure and terminology.

Mobility-Independency towards users work site*:* The distant learning actors must be free, to reach the platform resources, everywhere they are. Indeed, the learner and the teacher need often, to change work place, or environment (Linux, Windows, etc). The Web use ensures this mobility, since the used resources are preserved on the server, and the user can reach them from any Internet access point.

Adaptability-offering to every user just his needs: It concerns the adaptation of the training process to the learner needs. So, according to the learning actor's profile – Education system, pedagogical environment, terminology, speaking language- and especially to the learner's knowledge level, the platform adjusts its interfaces and generates specific courses content. It allows the adequate formulation of the contents and the system components.

Usually Learners have various objectives, and are interconnected through diverse environments. Thus, according to the learner's profile, the platform must adapt its interfaces with their education system.

A flexible platform, must thus adapt itself to users requirements and needs. Every learner should have access to a lecture, which can be adapted to his aptitudes, his training objectives and also to the socio-cultural and computer environment characteristics. Users (learner and teachers) should be able to use the system whatever their education system or their training pedagogy.

Re-use: It allows re-using the contents and components for various needs, applications, products, contexts and access modes.

3 SMART LEARNING SOLUTIONS

SMART Learning, by its architecture, aims to respond a broadest range of universality and general settings. In order to have independency towards the training environment specificity [2]of learning actors, we looked for a flexible structure that can adapt itself easily.

Let's remark that an education system can easily be structured in a hierarchical organization. Indeed, an education system is a coherent structure, carrying out training objectives. It is composed of training entities. The entities can be one school year, one semester period, a module, a unit of value, etc.

Each training entity is made up of training elements, such as the lecture, the chapter, the exercise, etc. The subdivision can go up to the smallest level of granularity of training contents. At this level we can fit elementary training information, such as a paragraph of text, an image, a slide, or other elements Medias (sounds, animation, etc).

Thus, independently of the adopted education system, and the used terminology to name its components, we are directed towards arborescence in the system structuring [2, 6].

To realize the independency concept, we have to set up an association between the specific terminology of each education system, and the corresponding elements in the arborescence. That will provide an interface that permit SMART Learning to be adapted to various systems specificity.

In our model, we propose an organization, which facilitates at the same time the definition of the training contents generic structures, and guarantees the coherence of the contents with a good adaptability. This model is valid for any education system. It tries to satisfy the guiding principles specified further, and with the training objectives.

Thus, SMART Learning treats in a simple way any component of the education system, whatever its complexity, like a whole of pedagogical sequences.

To organize in an abstract way the system arborescence, SMART Learning proposes a generic structure representing the training environment and contents as a tree [figure 1]. We named the nodes on the tree "Pedagogical Sequences". Then, we are able to represent multiple hierarchical levels, and to have a flexibility of representation, according to the selected education system.

Pedagogical Sequences are organized as a tree with several levels. On the lowest level, there are Elementary Pedagogical sequences (Spe). "SPE" represents to the weakest and atomic granularity. The leaves of this arborescence fit the media elements (EM) of the training contents.

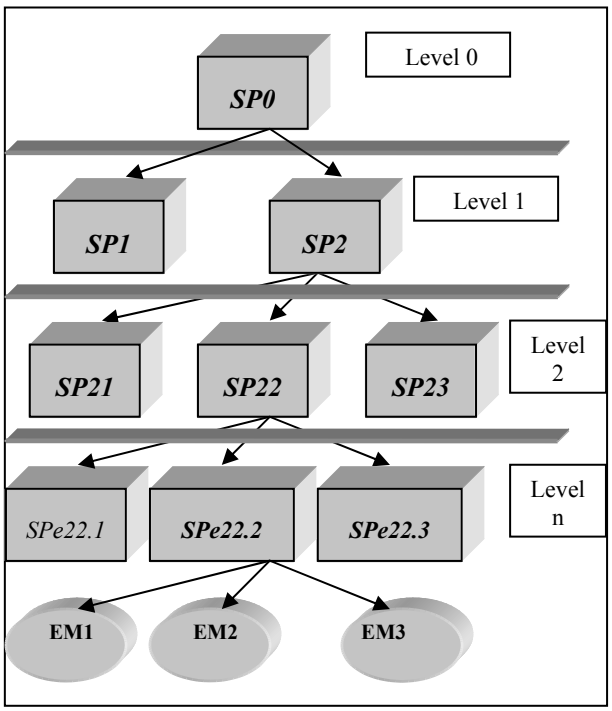

Figure 1: An example of SMART-Learning generic model

Figure 2 presents an example of generic model with three levels SP and one SPE. It associates the generic model with a course composition in French education system. The root SP0 is associated with a Chapter of course. SP1 and SP2 are associated with sub-chapters level. SP21, SP22 and SP23 are associated with the section level. And the SPE221 represent elementary course pedagogical sequence that is composed with four elementary media.

In figure 3 we present an example of generic model with three levels SP that associates French education system structure with the generic model. The root SP0 is associated with a "module", as a main element of course. Then the SP1 and SP2 are associated to a "course" and SP21, SP22 to "unit".

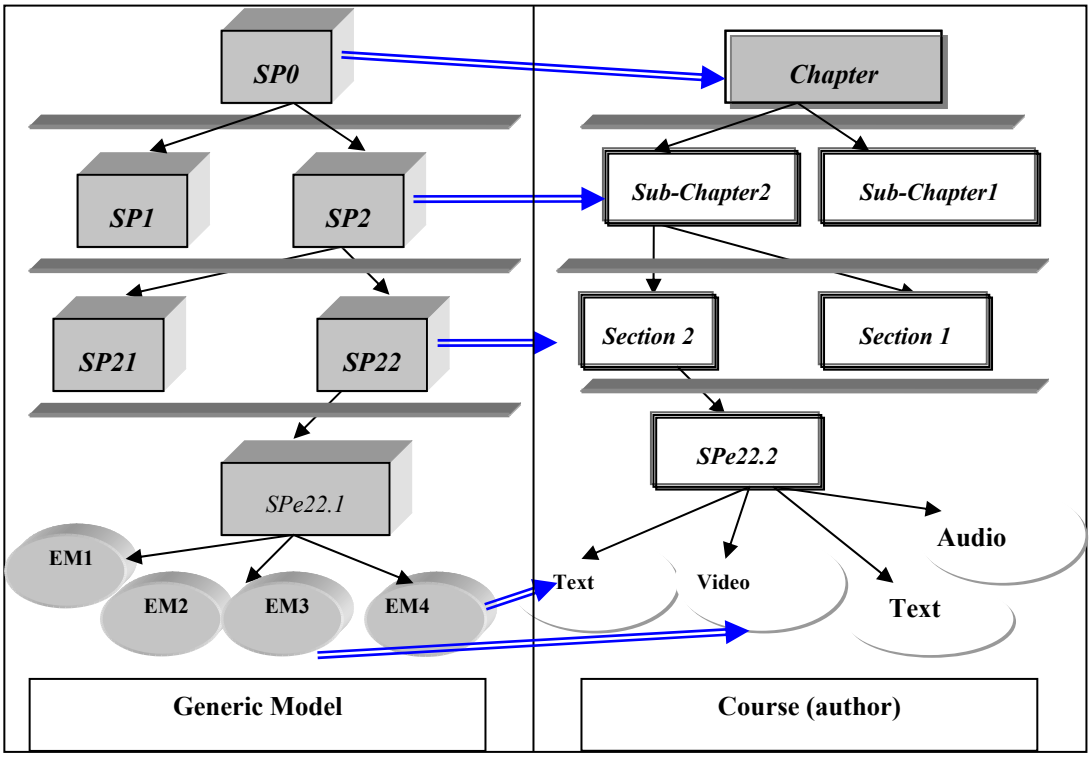

Figure 2: Association between SMART-Learning generic model and an example of course model

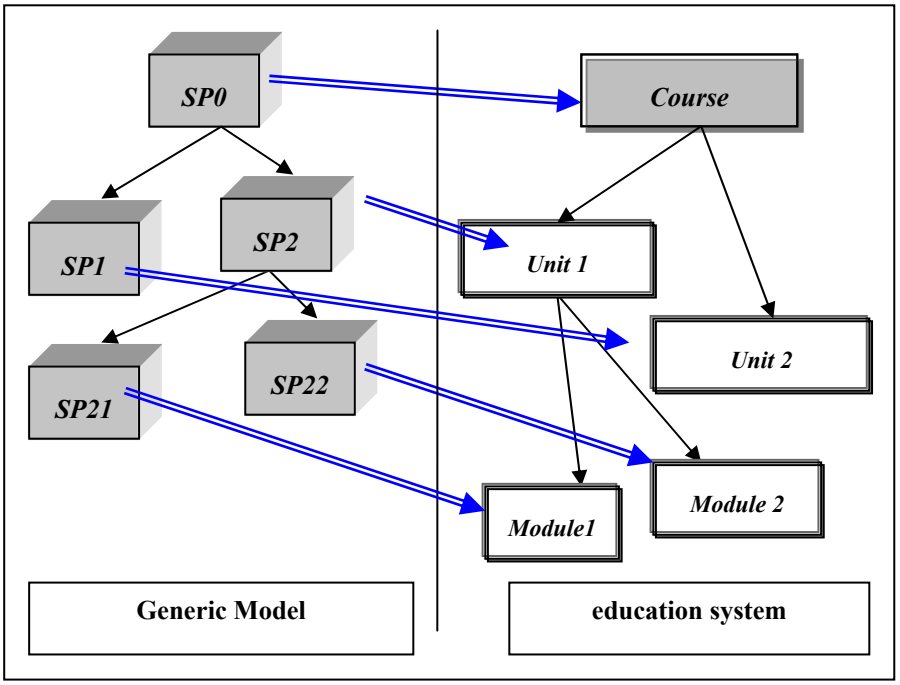

Figure3: Association between SMART-Learning generic model and an example of education system model

In order to ensure independence and modularity, SMART-Learning architecture conforms to the LTSA standards [4.8].

The main goal of LTSA is to provide a framework to support interoperability and portability (deployment in multi-platforms) of the elearning systems.

In this order SMART Learning supports the description in an abstracted way, of the principal components of the system architecture.

To provide multimedia elearning architecture, based on the Web, SMART-Learning is based on the integration of standard and open tools such as XML, XSL, DOM, Servlet and Java programming.

However lot of work has to be done in terms of standardization. No standard was recognized officially by the ISO, and in spite of significant developments, several questions remain without answers.

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