

# CONTENT PERSONALIZATION: ASSEMBLING THE PUZZLE OF STANDARDS

Santiago Pérez de la Cámara, Alicia Fernández del Viso, Carlos Rebate Sánchez, Edgar Rubión Soler, Eva Vázquez de Prada, Natalia Gómez Esteban  
*eInclusion Unit, Indra Software Labs  
C/ Acanto 11, 28045 Madrid. Spain*

## ABSTRACT

The following paper introduces the difficulties of using and combining the existing eLearning standards used to personalise the content presented to the user. While the use of standard has unchallengeable advantages, there are also limitations and integration problems when trying to combine them. This paper presents an approach proposed on the framework of the EU4ALL [European Unified Approach for Assisted Life Long Learning] Project to develop a Content Personalization module that integrates different standards referring to the user, devices and learning resources.

## KEYWORDS

Content personalization, standards, metadata, devices, user's needs and preferences

## 1. INTRODUCTION

To accomplish eLearning content personalization several elements need to be taken into account. These elements include: the student, the devices used and the learning resources accessed.

There are different standards available to characterise the student, the devices and the learning resources. While these standards can sometimes coexist in the same eLearning platform, they are never integrated to accomplish the same objective: provide the student with the most appropriate learning resources, and as a consequence contribute to enhance the learning experience and even the accessibility of the contents provided.

We will discuss the difficulties that the integration of standards that convey user, device and content information brings and we will explain the work that we have undertaken to personalise the content offered by an eLearning platform using a combination of standards.

## 2. OPEN THE PUZZLE'S BOX

There are many factors to consider in the content personalisation. The most relevant include:

- User's characteristics: preferences and needs.
- Context information: Which devices is the user using? Where is the user in a particular moment? Which is the current environment?
- Learning resources (also known as learning objects): Characteristics of the resources in two levels: at educational content level and at presentation level.

To combine the information related with these three factors provides a high degree of difficulty in the personalisation process. The possible combinations taking into account the different user's preferences and needs, the variety of existing devices, and the different formats in which the learning resources can be represented, are just too many.

It is easy to understand why in an ideal world the contents for e-learning courses should be created with independence of devices, user's preferences and needs. To this end, educational content should be separated of its presentation layer. For this reason, it is necessary to talk about metadata to describe every component involved in the personalisation process.

The use of metadata standards is an important step to solve the problem of having educational resources that can be easily selected according to the user device, preferences and needs, because metadata allow to describe each element in terms of a particular and well defined vocabulary. But the use of metadata has also some difficulties:

1. Standards are limited. They do not include ALL the possibilities that we will find in the real world. We have to find a way to model a real situation with only limited information.
2. Current standards do not speak the same "language". Normally they are stimulated from different organisations or institutions that make their integration difficult.
3. To migrate a system from one standard to another takes a high amount of effort and the need to have tools that automate this process.

If we want to mix user's needs and preferences, devices and learning resources we need to combine different standards to provide a suitable content personalisation that really adapts to the user.

In the study of the implications of standards in the personalisation process we have considered two approaches in the EU4ALL project: using already available standards vs. using new born standards.

## 2.1 Where are the Rules? : 1st Approach using Available Standards

The first approach considered was to use standards that have existed for some time such as:

- **CC/PP**: Composite Capability/Preference Profiles (CC/PP) is a specification for defining capabilities and preferences (also know as 'delivery context') of user agents. CC/PP is a vocabulary extension of the Resource Description Framework (RDF). Delivery context can be used to guide the process of tailoring content for a user agent.
- **IMS LIP** and **AccLIP**: The IMS Learner Information Package (LIP) is a specification for a standard means of recording information about learners. IMS LIP is designed to allow information about learners, including their progress to date and awards received, to be transferred between different software applications. The IMS AccLIP Specification provides a means of describing preferences so that learners can interact with an e-learning system regardless of disability, hardware or environment. The preferences IMS AccLIP Specification supports are based on those parts of a computer system (hardware and software) that can be adjusted to improve accessibility, rather than on type of disability. It concentrates on the display, control and selection of learning content, so that learners with alternative content or interface requirements can be supported.
- **LOM** or **Dublin Core** (DC): to depict the learning objects. They are used significantly by the eLearning community. Many tools have been designed to work with and manipulate LOM and Dublin Core.

The use of these different standards can be problematic, as illustrated in the figure below:

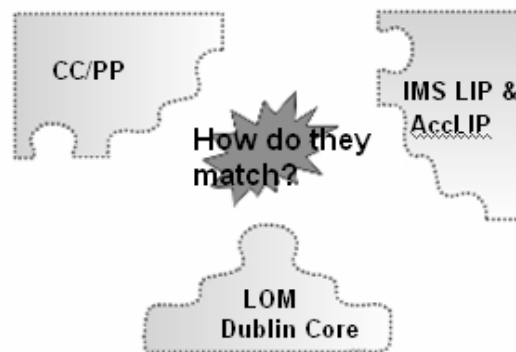


Figure 1. Problem: How can we use these standards together?

The big question is: How could we use these standards altogether? This question is motivated because each one of these standards was elaborated independently therefore there are no evident links between them. They use different vocabularies and have different structures.

To combine these standards takes a lot of effort. Mainly to normalize them all into a neutral language, which is not always easy to define. The main difficulties in this normalization are two:

- **The domain of each standard is different.** There are some particularities that belong to one single standard which cannot be found in others. For instance, IMS AccLIP includes an “access\_mode” attribute to describe how the user can access the information (it could be “textual”, “visual”, “olfactory”, “tactile”, etc.). However, this information is not taken into account by CC/PP, LOM or DC.
- **The range of values for each attribute is also different.** Even when attributes belonging to different standards share the same domain, the range of values they can take can be different. This inconsistency in the quantification of the attributes across standards complicates the translation process. For instance, IMS AccLIP describes the “languages” elements as ISO 639 values, and DC uses the Best Current Practice RFC4646 to describe its “languages” elements. They are talking about the same issue, but in different ways.

## 2.2 Assembling the Pieces: 2nd Approach using “NEW BORN” STANDARDS

The second possible approach is to use the newest standards of ISO organisation in this area (it is due to be published in 2008). These are:

- **ISO PNP** (Access for All Personal Needs and Preferences): PNP will describe the user’s functional abilities and the assistive technology or other non-standard technology in use as well as other user needs and preferences.
- **ISO DRD** (Access for All Digital Resource Description): DRD will define accessibility metadata that is able to express a resource's ability to match the needs and preferences of a user, as described by their Access for All Personal Needs and Preferences.

These standards will allow an important advance in the content personalisation, because they solve one of the afore mentioned problems: PNP and DRD “speak” the same language. Both standards use the same vocabulary (in domain and range), which makes possible to establish automatic translations between the user's preferences and needs, and the presentation of the educational content.

The following figure shows one of the problems solved in the matching process between standards:

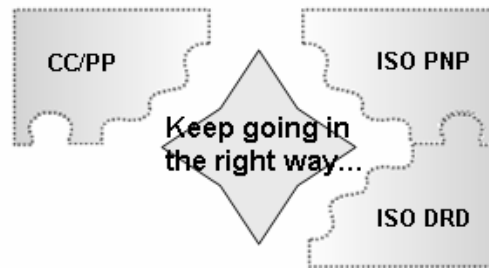


Figure 2. ISO PNP and ISO DRD talk the same language

The challenge now is to establish the corresponding relations with the standard used to describe the devices, that is CC/PP. CC/PP is a “de facto” standard that has been widely adopted by the industry and, therefore, it is difficultly to modify. For this reason, the next future challenge will be to manage that CC/PP and ISO come to an agreement.

### 3. CONCLUSION

There is a long way to go before eLearning platforms can seamlessly integrate different standards to enhance the learning process by providing personalised contents to students. The standardisation process is slow and costly.

The authors of this paper are working in the development of a prototype on the framework of the EU4ALL project that will implement the 1<sup>st</sup> approach proposed, integrating AccLIP, CC/PP and LOM/Dublin Core. The first prototype of this work will be available at the end of 2008.

Once PNP and DRD standards are made public, both will be used to implement a second prototype that combines them.

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