DIGITAL RIGHTS AND E-PAYMENT IN E-LEARNING
Completing the Learning Object Lifecycle

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Abstract: The learning objects paradigm actually drives the majority of researches and commercial developments in e-learning field. Nevertheless, this paradigm has been harshly criticized due to the fact that it has not achieved the objectives proposed in its initial definition. This, together with some false assumptions surrounding the e-learning concept, have led costumers and organizations to the belief that e-learning have not met its initial expectations, and have borne e-learning marketplace to a expansion lower than was expected. This paper describes how two emerging areas within e-learning field, digital right aggregation to learning objects and payment systems integration, can help the learning object paradigm to meet its initial expectations and can help the e-learning marketplace to go beyond its current barriers. Digital rights and e-payment will enable to complete the learning object lifecycle in an automated way, thus permitting on-demand, high-quality, low-cost learning.

1 INTRODUCTION

E-learning, when was initially conceived, was said to become the greatest potential market over the Internet, but "despite massive investments in both hardware and software, there has yet to emerge a viable market for e-learning products. Only course management systems […] and PowerPoint lectures […] have been widely accepted." (Zemsky & Massy, 2004). These spectations have not been met due to: (1) false assumptions and myths that have surrounding e-learning since its very beginning (Rosenberg, 2006; Zemsky & Massy, 2004), (2) technology limitations associated to e-learning (Barr, 2006; Sloman & Buren, 2003), and (3) lack of pedagogical and didactic issues in technology-enabled learning approaches (Feldstein, 2006; Friesen, 2004; Sosteric & Hesemeier, 2002). E-learning needs to overcome these problems and limitations in order to fully achieve its marketplace potentials.

Within e-learning, the learning object paradigm drives almost all initiatives. This paradigm encourage the creation of small reusable learning units called learning objects. These learning objects are then assembled and/or aggregated in order to create greater units of instruction (lessons, courses, etc) (Wiley, 2000).

The technologocial-related problems in e-learning are associated to the learning objects paradigm and its related technologies. Among these problems, two are gaining increased importance: Copyright issues are left out of consideration (Bohl et al., 2002), and the integration of payment gateways within current e-learning systems in a flexible way (Hämäläinen et al., 1996). On the other hand, the society demands lifelong, on-demand, adapted, high-quality learning, E-learning technology must acommodate these problems in order to as become flexible as the society demands.

This paper presents a solution to address right management and payment integration problems around e-learning initiatives.This solution is based on the learning objects paradigm and it is viable within the current available learning technology status. Section 2 depicts this conceptual model proposal, that is based on the definition of a complete lifecycle concerning learning objects, since its creation to its final delivery, billing and charging. In section 3 the proposed model benefits are

presented. In section 4 the technological steps necessary to made this solution operative are described. And finally, section 5 outlines the extra developments that could be done in order to improve the proposed model and the e-learning solutions.

2 CONCEPTUAL MODEL PROPOSAL

In order to automate the learning object process, the complete lifecycle of that objects should be considered. In the same way that in object oriented paradigm the object lifecycle comprises from the object creation to its destruction, in the learning objects paradigm the initial and the final points must be defined.

The learning object lifecycle begins when the reusable learning objects are created by the content creators. According to current literature, the learning object lifecycle ends when that object is delivered to the final learner (Daziel, 2002; Grewal et al., 2005). Even if this delivery is done successfully according to copyright restrictions (i.e. allowing access to authorized learner or denying it to unauthorized ones), we consider that this lifecycle should not be completed until the moment the author gets the return of investment of its initial development.

Figure 1 presents the learning object lifecycle within the proposed framework. According to that model, *content providers* create the initial *learning objects* (LO). A *digital right* (DR) specification (called rights object) must be attached to each learning object to complement it in a twofold way: First, it ensures that the copyright restrictions are distributed with the object; and second it may content the payment data (price, payment mode, etc.). Payment data will not be attached when the objects are intended for free use, but the rights specification should be attached to the learning object even if the object is intended for free use, "if for no other reason than to avoid the risk of inappropriate commercial sale of free public domain items" (Daziel, 2002).

The learning object (with its digital right specification) is then stored in a *repository*. This repository, and other distributed repositories across the Internet, must publish its learning objects information in order make possible for *federated search* engines to find them. When the resources are published, *instructors* use a *LCMS* (Learning Content Management System) to built courses by assembling learning objects. These learning objects have to be retrieved from the local repository or from remote repositories using the federated search system. The LCMS is hold responsible for presenting license agreements to instructors, and instructor must accept the licences in order to include the learning objects in the courses.

After the learning experience (course) creation, the *course* must be published in the *LMS* (Learning Content Management System), so that the final users (learners) can access the learning contents. Learner connect to the LMS and access to the courses designed by the instructors, when a specific learning object needs to be accessed, it is delivered to the learner so that he or she can receive the instruction.

In order to complete the learning object lifecycle, one more process and two more flows are required. A '*payment management*' process must collect the payment data from learners (provided by the learners or by the organization he/she belongs to) and the learning objects usage (retrieved from the LMS) in order to execute the charges related to the learning objects the have been accessed. The payment management could handle extra issues, such as billing and invoicing, discounting, payment modes, etc. The LMS is hold responsible for presenting license agreements to learners, and learners must accept the licences so that learning objects could be delivered to them.

Finally, the payment management process pays to the content creator the owed amount for the learning object usage. The payment management is depicted as a process in Figure 1 and it could be integrated in the LMS, it can be implemented as an external system, or the service can be handled by (outsourced to) third parties.

3 MODEL BENEFITS

First of all, the proposed model makes possible an automated and flexible processing of the learning objects. The automated processing produces a cost reduction due to the lowering of administrative tasks and administrative staff that the organizations are carrying nowadays to accomplishing such tasks. The flexible processing is achieved due to the capacity of the model to serve and charge the learners only for that objects that are really using. This encompasses (1) 'the broader view of e-learning' (Rosenberg, 2006), that it is the e-learning capability to deliver critical-content and lifelong-learning, and (2) the PaWYRN (pay-what-you-really-needed) model (Binemann-Zdanowicz et al., 2003) for learners.

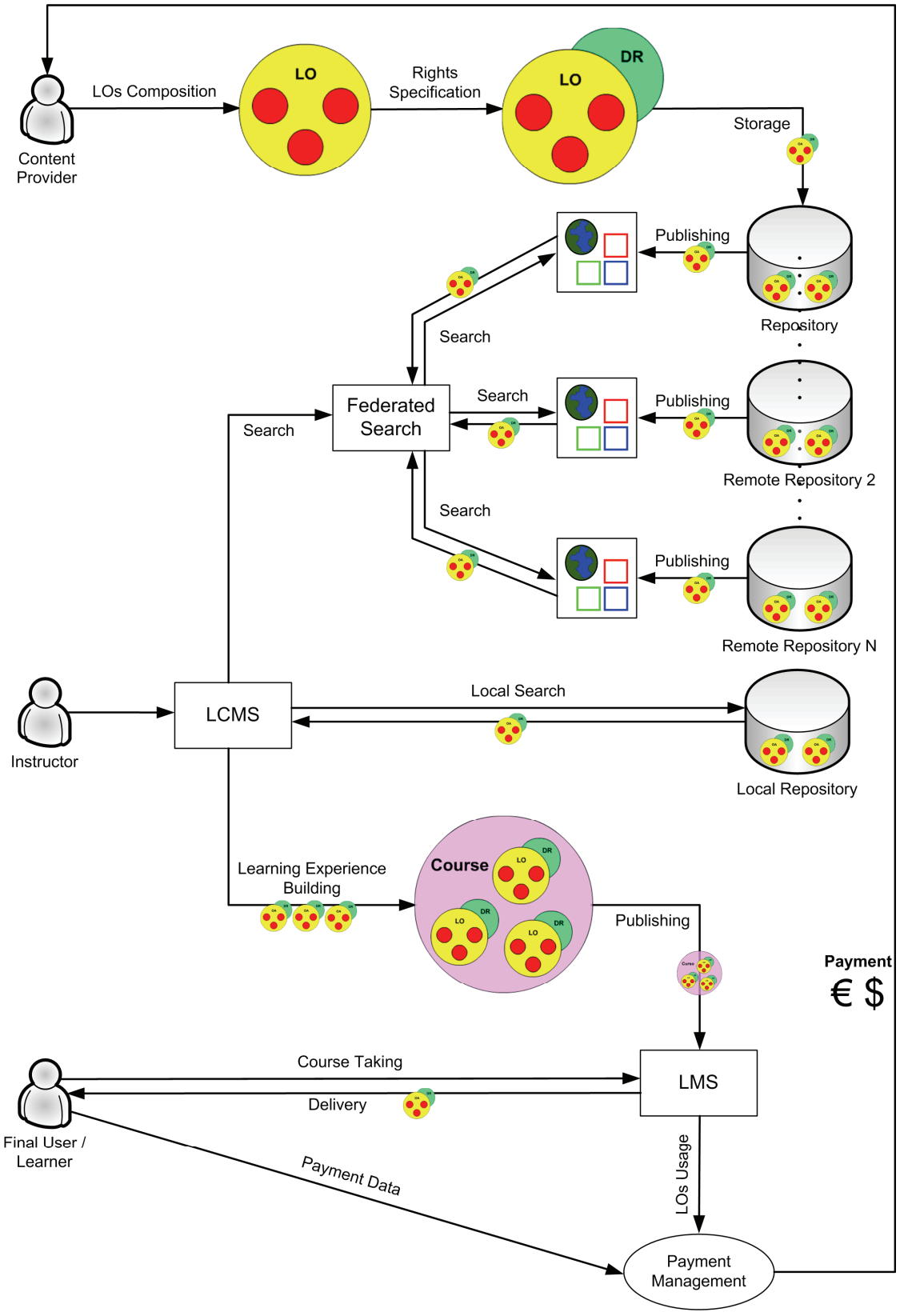

Figure 1: Learning Object Lifecycle.

Static and dynamic pricing models (Gruene et al., 2005) are enabled, so that organizations can offer contents in a tailored way regarding its necessities and opportunities. Also, several payment models (pay-at-once, pay-per-feature, pay-per-time) can be used (Binemann-Zdanowicz et al., 2003).

Flexibility is also available to content providers and instructors. Content providers could buy contents to other content providers to 'adapt' it or to 'include' it in its own content in a flexible way by making the suitable changes in the license definition. Anyway, content providers could make its content license-unchangeable in the digital right definition.

ROI (Return of Investment) and copyright are guaranteed to the content creators. We think that this is necessary to create a viable open e-learning marketplace. Current open systems developments lead to free systems and contents that are nonviable for profit-driven organizations.

Courses assembled with learning objects from different sources are made possible, while payment to each of these source-content providers for its objects usage is guaranteed.

Each component (and actor) of the system, and its responsibilities, are clearly depicted. With such separation, several organizations can enter into the e-learning marketplace, and each organization will offer one or more services. So, we could have in the e-learning arena content providers, publishers and repository managers (including repository system vendors), federated search engines providers or searching services providers, copyrights holders and managers, LMS and LCMS vendors, and payment intermediaries.

4 MODEL NECESSITIES

The model comprises the complete learning object lifecycle and enables a flexible control, delivery, and payment of learning objects. But, what are the technological requirements to make the model implement-'able'?

First of all, compliance with current e-learning standards and specifications is necessary. LOM (Learning Object Metadata) standard (IEEE, 2002) should be used to catalogue learning objects in order to enable precise searches. Digital Repositories Interoperability specification (IMS, 2003), developed by IMS, should be used in order to ensure learning objects storage and retrieval interoperability among repositories. And SCORM (Shareable Content Object Reference Model) specification (ADL, 2004) should be used in order to ensure: (1) courseware interoperability among different platforms (LMSs and LCMSs), and (2) a common pattern for describing and reporting access to learning objects, so that learner could be charged for them and content providers could be paid.

Available specifications must be extended to incorporate digital rights and price modelling within individual learning objects. Current literacy quotes the lack of concepts in current standards for the integration of copyright and price (Binemann-Zdanowicz et al., 2003; Bohl et al., 2002; Downes, 2003; Gruene et al., 2005), and it present some methods (and even implemented systems) to cover the identified lacks. These methods include: (1) Integrating digital rights expression languages within the learning objects description. The digital rights description could be attached to the learning object or it could be stored externally and pointed by the learning objects (Daziel, 2002; Grewal et al., 2005). (2) Extending current metadata descriptions to include digital rights or pricing models (Grewal et al., 2005; Gruene et al., 2005). And (3), defining new methods of integration regardless of current specifications (Binemann-Zdanowicz et al., 2003; Tschiedel et al., 2003).

Finally, the developed system/s should be integrated with current commercial payment gateways. For that purpose content provider and costumer (learner) needs should be considered as well. Possible payment models include pre- and post-payment, as well as micro- and macro-payment.

5 FURTHER IMPROVEMENTS

Some improvements are considered for further research in the near future. These include the following:

Automatic content adaptation based on learner needs. Intelligent tutoring systems (ITS) and adaptive learning systems are an active research line, whose researches offer some possibilities that should be reviewed in order to improve the proposed model.

Automatic content adaptation regarding interface and corporate image issues. Organizations are actually facing large investments just in content adaptation to different platforms and to corporate image interface requirements. The proposed model should be extended to handle this issues by defining methods that clearly separate interface and contents in learning objects, and use transformation/combination methods to create the final content.

Web service integration. Web services can improve interoperability between platforms, between contents, and between platforms and contents. An approach of the model from the web services side could be described

Negotiation systems (so that different actors could negotiate, between them, the terms and conditions of learning contents) and more flexible rights management (so that actors can deal, accept, refuse, change or negotiate the rights flexibly) are just another potential research lines.

Finally, not only learning object lifecycle should consider, but e-learning lifecycle should be considered as well. E-learning comprises the whole learning process from the initial definition of the learning objectives to its achievement and notification (Daziel, 2002; Gruene et al., 2005). The relation between the e-learning lifecycle and the learning object lifecycle must be researched, aiming the largest automation possible of the e-learning process, while improvement of e-learning paradigm and e-learning objectives are also taken into account.

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