

LEARNING OBJECTS: A MODEL FOR COLLABORATIVE CONTENT PRODUCTION AND A CASE STUDY

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Abstract *This paper presents a collaborative model for the development of learning content based on the Learning Objects and learning standards paradigm. In this model, development efforts and results are shared among companies, universities and new players in the education and training arena: the e-Learning content providers and integrators.*

Index Terms *content production, elearning, learning objects, metadata*

I. INTRODUCTION

A lot has been already said about Learning Objects (LOs) and the way in which they are shaping the future of e-Learning. The economics of LOs [3] have usually been the context in which the issue arises, although current pedagogical oriented discussions on instructional design, assessment and interaction levels have included LO technology in their scope. However, an integrated approach to the problem of content production including both economical, pedagogical and implementation issues has seldom appeared in the technical literature. Maybe that happens due to the relative timeliness of both standards compliant and pedagogical compliant content production concerns.

What has often been the case in the near past is that corporate and academic users developed their own model of e-Learning without resorting to instructional design or even standardization support. The result should not have come as a surprise when it turned out that many of the students were not learning what they were supposed to learn. Costs for content development were climbing up to the roof while investment results pointed out to the inefficiency of e-Learning in the corporate training context. Companies that learned their lesson from the past and wished to give e-Learning a second chance turned their efforts to strategic issues such as:

- Assessing their learners' cognitive models and mapping their capabilities and abilities.

- Using instructional design techniques to adapt content to their learners' needs.
- Matching learning goals to the needs revealed on the primary assessment.
- Reducing content development cycles and costs by using the reusable LO paradigm and metadata tagging.
- Choosing and implementing a Content Management System and later on a Learning Management System capable of managing content, LO banks, customize curriculum, track performance, monitor and register learners' progress.
- Using simulation extensively as a support tool for the learning process.
- Stimulating interaction among learners by setting up virtual communities.

Among the successful initiatives listed above, there are two concepts that summarize much of what has been done in the e-Learning industry: LOs and standardization [1][2][6].

This paper aims to present a collaborative model for the development of learning content based on the LO paradigm and on the learning standards. In this model, development efforts and results are shared among companies, universities and a relatively new player in the education and training arena: the e-Learning content providers. Section 2 introduces relevant concepts about LOs and metadata. Section 3 presents the proposed model for content development. Section 4 presents the case of Syllabus/CRT Brasil Telecom/PUCRS to illustrate how this model can be applied successfully. Section 5 presents the results and finally, Section 6 presents the conclusions.

II. LEARNING OBJECTS AND METADATA

Learning objects

We do not intent to present a rigorous definition of a Learning Object, but rather a functional one, which is suitable to the context of this paper. Our definition is:

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"A Learning Object (LO) is a small, self-contained piece of knowledge content turned to the satisfaction of a well defined and specific learning goal."

These LOs [10] can contain one or more Information Objects, which may include text, images, video, animations, exercises or similar material. The reutilization of such LOs will be supported as a means for reducing content development costs and development cycles. This reutilization will be achieved by using XML based languages and by attaching metadata tags to these objects.

We believe that from now on, most of the content produced for e-Learning will be using, at some degree, the concepts of LOs and metadata, since content produced in this way will have a greater probability to be reused for other purposes besides those for which they have been primarily produced.

Metadata

Following a functional definition fashion, metadata can be defined as "information about information". The metadata will describe LOs, including attributes such as author, subjects, date, price, interactivity level, difficulty level, etc.

The use of metadata will allow the appropriate storage of information in large databases of LOs known as knowledge repositories. Furthermore, metadata tags added to LOs will make it easier for automated search engines to successfully search for a specific learning experience from one of these knowledge repositories.

III. A MODEL FOR COLLABORATIVE CONTENT PRODUCTION

In this section, the model for collaborative content production is presented.

We assume the existence of the following characters in an e-Learning environment: corporate, academic client and/or provider, e-Learning integrator, and free agent service providers. Each one of these roles may be decomposed in sub-roles depending on the complexity and the expertise necessary to complete the task. Let us take a closer look at the role of each one of these characters.

Corporate characters

Corporate characters [9] constitute the service demanding part of the business. They have a mission to accomplish and a business vision to pursue. They are aiming to train their workforce, increase their competence and skills to execute certain tasks that are necessary to achieve their business goals. They consider e-Learning as a means to leverage a competitive advantage over their competitors.

Corporate characters may be interested in establishing partnerships and alliances with the other characters depending on the timeframe they envision for a return of investment and on the level of commitment they are aiming to assume. This is usually the attitude of companies that do

not find appropriate solution providers capable to fulfill their needs or wish to keep an active role in such a strategic issue.

On the other side, corporate characters may be willing to assume a more marginal position in the whole process, focusing on their expertise and completely outsourcing content development and implementation of the solution.

Thus, the corporate character provides learning demands, development schedules and the most important component of the whole model: the learners!

Academic characters

The role of academic characters (higher education institutions) in e-Learning history has been most diverse. In the early days of e-Learning, Universities assumed the responsibility for concept development from scratch. Nowadays, besides academic research, universities found a promising market on work-and-study learners who need a more flexible schedule and have specific knowledge needs that can be more efficiently matched by on-line learning. The number of North American higher education institutions that offer undergraduate, graduate and continuing education on-line programs has increased exponentially in the last years.

As a general rule, academic players have chosen either satellite video broadcast as their preferred media for content delivery or raw hypertext with no interaction. Although this choice may diminish development cycles and costs (since already existent material can be more easily adapted to this media), efficiency of traditional classroom-based methods when migrated to distance learning suffers from the nearly complete absence of interaction among learners. E-Learning, with its interaction oriented design and support for collaborative experiences compensates for this deficiency.

E-Learning demands a cultural change in the way learners view education and a methodological change in the way the university faces its new role as a knowledge provider to virtual environments instead of traditional classroom-based education provider. We believe that if universities do not prepare themselves for a dramatic change in their business models, they will soon be facing a competition for a market share that they have always taken for granted: distance learning.

Free-Agents

Free agents are those professionals that do not have an employment contract with a company but are rather dedicated to provide fast solutions to very specific problems. Their competitive advantage is the high expertise in a specific field and flexibility. Their work is usually characterized by periods of intense dedication to a specific project followed by periods of dedication to training and self-study. Free agents are suited for *ad hoc* tasks necessary to the development of content for e-Learning, however they are seldom prepared to develop a complete solution to the problem.

E-Learning Integrators

E-Learning integrators are those characters responsible for coordinating the efforts of development, publication and management of content in an e-Learning system.

This category includes content providers (to create content based on instructional design technology to match learner's needs), knowledge hosts (to host content in their own premises) and to provide knowledge managers (to manage content, track students' records and system administration). The need for Integrators appeared when e-Learning changed its status from a visionary experiment to become a solution to educate more individuals, faster, more efficiently, anywhere and anytime.

The switching matrix model of interaction

Figure 1 shows the dynamics of interaction among the characters involved in the e-Learning market.

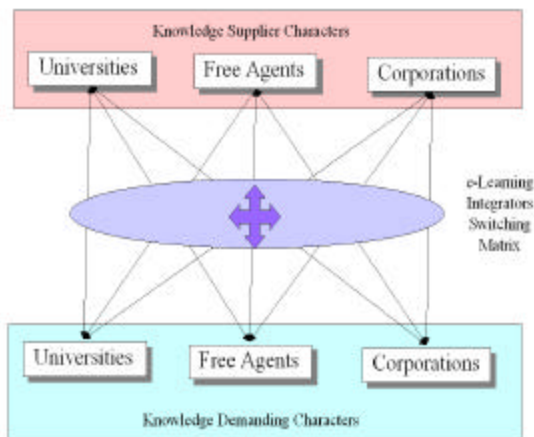


FIGURE 1: THE DYNAMICS OF INTERACTION AMONG CHARACTERS

Note that the characters introduced in the previous section can assume either a knowledge demanding position, knowledge supplying position or even both. This means that for the production of a given e-Learning project, an individual can provide content, design and implementation services acting primarily as a supplier, and at the same time can benefit from the final product resulting from the integration of his efforts with similar efforts from other suppliers. This synergy stimulates the creation of alliances and partnerships between service providers and clients in such a way that all the characters involved benefit from the project. Such partnerships are essential to the dynamics of the market since they accelerate both the implementation, creative thinking and quality work, since all the parts involved are motivated to create a product that will serve themselves as well.

Observe the existence of another character in this figure: the e-Learning integrator. His role in the process is to coordinate joint efforts to build the final knowledge product. In order to accomplish this task, he uses his expertise in:

- Instructional design [8]: migrating knowledge represented in traditional forms to the media and experiences more suitable for effective e-Learning.
- Supplier network: the e-Learning Integrator has the answer to the questions "who knows what" and "who does what" in such a way that he can turn training goals into knowledge products.
- Assessment: using assessment tools optimized to the e-Learning environment, the Integrator can figure out gaps in the education and abilities of his client's learners
- Curricula Management: the Integrator is able to advise his client on the educational needs of his learners in order to accomplish a business goal.
- Technology infrastructure management: the e-Learning Integrator can provide full technological support to his client either by advising the implementation of a specific solution or by creating an Application Service Provider.

Thus e-Learning Integrators can be seen as the "Switching Matrix" which "switches" the flow of information, services and demands among the characters and still coordinates the overall efforts for successful project implementation. Integrator position is strategic into the overall system, since it adds intelligence to the content production process by adding valuable information on effective e-Learning techniques [5][7][4] and methods and by managing the resources available.

IV. CASE STUDY: SYLLABUS/PUCRS/CRT BRASIL TELECOM

Introducing the players

CRT Brasil Telecom (CRT) is a major local and long distance telecommunications operator in southern Brazil. After the privatization of the Brazilian telecom market, CRT found itself inserted in a permanent effort to sustain and expand its market share in the now highly competitive telecom market. Rather than relying on a low price strategy, competitors bet in their ability to provide value added services faster and more efficiently than the previously state owned CRT. Expecting to face this competition by increasing quality of service, offering value added services and improving customer relations, CRT decided to invest heavily in training its employees, thus expecting to better qualify its workforce to reach the efficiency levels required to face competition.

Pontifical Catholic University (PUCRS) is one of the largest private university in Brazil, with more than 22,000 students enrolled in its regular programs. In order to prepare itself to consolidate a strong position in the newcomer distance education market in Brazil, PUCRS created an academic division oriented solely to distance education. Its strategy is to provide access to higher education programs to some selected corporations in need for capacitating its technical workforce.

Syllabus e-Learning is a start-up company established in southern Brazil, with a business model focused on the production of customized learning content to corporate clients. Syllabus strategy is to produce learning content fully compliant with major learning standards [1][2][6] using the LO and metadata paradigm. Syllabus knowledge assets include a repository of around 5,000 learning objects and a portfolio of corporate clients, instructors, tutors, web application development teams and alliance partners.

SEND: A successful model for corporate training

In order to achieve its goal to capacitate its workforce in diverse areas such as technology, business and leadership, CRT deployed massive investments in the development of a fully integrated distance education platform, named SEND. This platform is offered in SEND's portal in the company's Intranet. It includes synchronous and asynchronous learning experiences, such digital video banks, e-Learning web courses, on-line and off-line tutoring, virtual communities, collaborative environments and digital libraries. SEND turned out to be a highly efficient model for corporate training. It received several awards for its successful design and management, such as the ABRH's (Brazilian Association of Human Resources) Top Human Being 2000, at the Regional and National levels.

Syllabus model scales up SEND's success

The lack of custom designed courses for e-Learning platforms available in Portuguese (the local language), forced SEND's team to take the responsibility for the development of its own learning content. Betting on internal research teams, SEND's in-house solution showed to be successful. However, when it became necessary to radically scale up custom content production, the in-house solution became a bottleneck, motivating the search for a new strategic partnership. This partnership focused on the development of a collaborative model for the production of content to be distributed in an e-Learning platform.

Syllabus found in its LOs repository a rich source of content suitable to meet SEND's needs. Deploying reusable LOs backed on XML technology, development cycles were reduced by 70% as compared to the in-house solution. A substantial cost reduction was also noticed.

Figure 2 shows Syllabus's "knowledge switching matrix".

PUCRS's research team joins the partnership

Finding a good opportunity to test new methodologies for distance learning, a group of researchers at PUCRS joined the Syllabus-SEND partnership and begun to create learning materials that could be used to meet CRT's training needs. Working directly with Syllabus's instructional designers and CRT's human resource engineers, PUCRS researchers could manage to adapt their learning material to the LOs paradigm in order to offer richer learning experiences suitable to the constraints of e-Learning.

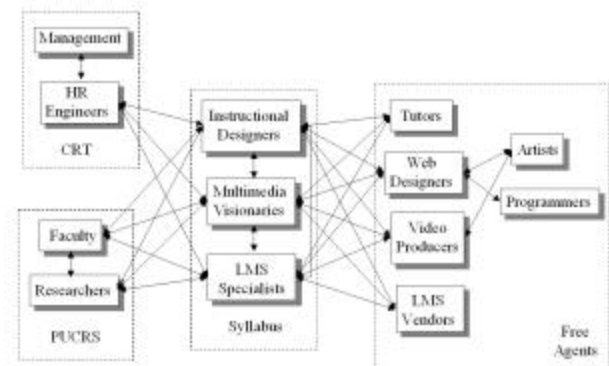


FIGURE 2: SYLLABUS'S KNOWLEDGE SWITCHING MATRIX

V. RESULTS

Using the model described for content production, the development cycles were reduced by almost 70%, while marginal costs per learner decreased 80% compared to traditional classroom-based training courses. Due to an intellectual property agreement, Syllabus kept the right to commercialize LOs produced, CRT got lifelong utilization rights over LOs for a limited number of learners and distribution over the company's Intranet, and PUCRS kept the right to use LOs in academic applications restricted to a limited number of users.

VI. CONCLUSIONS

In this paper a collaborative model for content production destined to distribution over the Internet-Intranet was presented. The model was based on the concepts of Learning Objects, metadata and Learning Standards. A case study involving a corporate, an academic institution and an e-Learning start-up was presented to validate the model proposed. Positive results indicated severe cost and development cycles reduction. The democratization of the access to knowledge was reached by the synergetic relationship achieved by characters involved, since intellectual rights related issues were resolved towards mutual benefit of the parts.

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