A MODEL-DRIVEN AND EXTERNAL APPROACH FOR LEARNING DESIGN UPON LEARNING MANAGEMENT SYSTEMS

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Abstract: The research work presented is about helping teachers-designers in focusing on instructional design activities when using widely spread *Learning Management System*. We originally propose to focus on the implicit LMS pedagogical language and to exploit it outside of the LMS by well-suited instructional design tools. We concretely propose to follow a *Domain Specific Modeling* approach in order to formalize the LMS abstract syntax (meta-model) and to use it as a basis for the elaboration and development of *Visual Instructional Design Languages* and dedicated tools. We also propose to extend LMSs with a communication API for importing/exporting courses/scenarios from/to these graphical editors.

1 INTRODUCTION

Nowadays, Technology Enhanced Learning environments like *Learning Management Systems* (LMS) are widely spread and are not restricted for intensive and distant learning uses. Most of academic organizations provide teachers with some LMSs and services for improving their face-to-face courses by some additional activities.

Within the last decade, many languages and tools have been designed in order to provide support to the instructional design actors (Koper, 2006). Notwithstanding these potential support, the design and setting-up of distant learning situations have not reached a mature and accessible level for providing most of teachers with some user-friendly and soundly all-in-one or automatic solutions. The operationalization of learning scenarios is still an issue.

We are interested by teachers-designers using LMS within their academic organizations. They directly use and handle platforms for setting up the pedagogical situations they mentally designed because of their weak instructional design culture and weak help from their organization. They have to understand the underlying "way of thinking and designing" of these platforms, their implicit domain-language. They also have to appropriate the various screens and form-based interfaces, to abstract some low-level details to think about the global design of the courses they are setting up, etc. As a consequence, LMS like Moodle are not spread and used as they could do, essentially because most teachers are not familiar with that implicit learning design domain (Martinez-Ortiz et al., 2009a).

We aim to help such practitioners to better use and apprehend the LMS implicit instructional design language, and then help them to improve the design of learning situations. We are then interested in instructional design approaches and solutions that could be either internal or external to the LMSs, taking into account the binding and operationalization of produced scenarios and in relation to the LMS instructional design semantics.

2 EXISTING APPROACHES

Several approaches aim at facilitating the design of courses by focusing on the specification of learning scenarios and their binding into concrete LMSs. The intervention of platform experts is no more indispensable but these approaches require an infrastructure for interacting with the platform and for taking in charge the automatic creation and configuration of the working spaces, as well as the activity performance, starting from a formalized description of the targeted learning situation. Such

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approaches require a 'domain language' or *Educational Modeling Language* (EML), allowing modeling the learning activities, as well as a 'binding' technique to be machine-readable. These approaches also require some techniques and tools to support the 'operationalization' step consisting in bridging the gap between the formalized and machine-readable learning situations and their concrete setting-up into a dedicated learning environment.

The LAMS solution (Ghiglione et al, 2007) consists in integrating a graphical internal editor to some LMSs like MOODLE. It offers a user-friendly interface to designers but produced scenarios or courses are related to a specific runtime engine to add to the LMS. This approach does not rely on the LMS internal semantics. Other approaches focus on the proposition of specific EMLs or *Visual Instructional Design Languages* (VIDLs) with 'larger' semantics (Botturi et al., 2007) but they also raise operationalization issues like the loss of information. Excepting the all-in-one infrastructures and EML/VIDL for practitioners, specified and built together (e.g. the LDL language and the LDI runtime infrastructure dedicated to play LDL scenarios (Martel et al., 2006), none of the current instructional design propositions concerns a direct operationalization of practitioners-centered learning scenarios on some LMS or direct transformations towards equivalent scenarios conformed to some LMS centered languages.

The COLLAGE proposition (Hernández-Leo et al., 2006) is interesting because the collaborative design patterns proposed to practitioners have been specified and developed on top of the IMS-LD standard: semantics about concepts/relations transformations have been taken into account when building the patterns; these patterns are so fully-compatible with IMS-LD. The operationalization of COLLAGE models then tackles the problem of operationalizing IMS-LD models. Unfortunately, existing LMSs are still not compatible with this standard (Berggren et al., 2005).

Although CopperCore can be used as an IMS-LD runtime engine, such complex tool is, as far as we know, rarely used or integrated to LMSs. Moreover, the scenarios specified by Collage, or other editor dedicated to specific EMLs (IMS-LD, LDL, CPM, etc.) do not focus on LMSs languages (ie. the LMSs learning paradigms and features).

Also, most of research works that deal with the exportation or transcription of learning scenarios have highlighted the semantic learning design gap that appears when considering learning scenarios concepts and platforms features (Abdallah et al., 2008, Caron et al., 2005). Such scenarios transcriptions lead to some losses of information from the source scenario or to some incomplete informations into the platform transcription (lack of sufficient information from the source model to specify at the required level the platform elements). This conceptual gap between two learning design languages is inherent to the transformation process when both languages have been elaborated with no reciprocal relations.

3 FOCUSING ON THE LMS SPECIFIC LANGUAGE

Current propositions rely on a same underlying idea about evolving existent LMS by large add-ons (editors or runtime engines) and new semantics in order to integrate learning design standards or to improve the design.

We do not aim to add new semantics to the domain specific model embedded into the LMS. We assume that each LMS is not pedagogically neutral and that it embeds an implicit language for describing the process of designing a learning activity. Thus, our proposition is based on the following ideas this language can be identified and explicitly formalized in a computer-readable format; this format can be used as a binding format for various external tools which will focus on different designing facets. LMSs have to be able to import/export learning scenarios in conformance with this language: current platforms have notwithstanding to evolve in order to offer this new functionality. From an LMS viewpoint, our proposition is to add a similar 'import/export' functionality like the SCORM one but with their own language. We propose so a kind of new labeled standard: self-compliance LMS. This will warrant e-learning tools developers that they could exploit this explicit language (that will have to be accessible through an XML schema for example) for communicating with the LMS. Operationalizing a learning scenario from this LMS-centered viewpoint will consist then in the importation of a learning scenario formalized in conformance to this explicit LMS language.

We also propose an original TEL-centered *Model-Driven Engineering* and *Domain-Specific-Modeling* (DSM) (Kelly et al., 2008) approach both to identify/formalize the LMS language and to use it as a basis for the elaboration of LMS-centered

VIDLs and their dedicated authoring-tools. From a metamodeling viewpoint, every LMS language can be considered as composed of an abstract syntax (formalized as a metamodel and additional well-formed rules), a concrete syntax (the machine-readable textual notation that will be used for the binding of learning scenarios), and some semantics for both syntaxes.

The explicitation of LMSs languages allows the specification of VIDLs/EMLs on top of them on several layers of abstraction. This approach will propose also a new opportunity to operationalize learning scenarios. A first step for this approach is to provide practitioners with some external learning design editors based on the LMSs languages. It is also important to provide practitioners with some learning design editors dedicated to the VIDLs built on top of the LMS language. Many VIDLs can be proposed for a same LMS language. These LMS-centered VIDLs have to be composed of the same abstract syntax than the LMS language (same domain meta-model), but have to propose a visual notation (e.g. concrete syntax) in order to facilitate thinking and communication for practitioners (human-interpretable formalism). In contrast, the dedicated editors of these VIDLs have to manage the persistence of produced learning scenarios in the machine-readable format of the considered LMS.

Our propositions are focusing on a DSM approach that aims to offer a practical solution to produce scenarios according to the semantics of the LMS language. DSM tools will manage the binding to the LMS machine-readable format. We propose to use them in order to elaborate some LMS-centered VIDLs and dedicated user-friendly editors based on the meta-model of the identified LMS language.

We have experimented such DSM tools, the ones from the *Eclipse Modeling Project*, able to specify all these artifacts (domain meta-models, graphical and textual notations, generation of dedicated editors, etc.). These tools have been experimented within several projects of different scopes and following practitioners centered viewpoints as well as TEL-centered ones (Laforcade , 2010).

Our LMS-centered solution guarantees that future produced scenarios will be implemented on the concerned LMS taking account the probability that this solution may restrict the pedagogical expressiveness of learning scenarios. But we assume that the explicitation of the internal LMS language will create the opportunity to build more practitioners-directed but LMS-centered on top of the initial LMS language.

4 A FIRST PROTOTYPE

For evaluating the potential of this approach, we have initiated an action whose aim is to develop a simple external editor based on the Moodle-centered language and to study how to design and operationalize a learning scenario with this editor.

The first step was to study Moodle itself from a user centered viewpoint in order to identify the main concepts of the implicit Moodle language. Then the analysis of the various Moodle interfaces allowed us to identify the language. We have refined this language by analyzing the internal Moodle database. Then we have capitalized this knowledge into a specific metamodel.

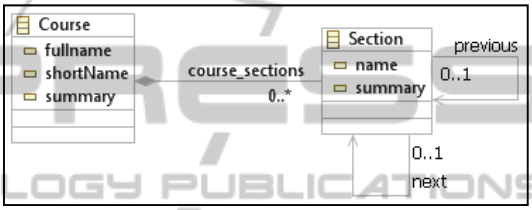

Figure 1: Domain definition model.

On top of this metamodel we have developed a very first visual editor. It aims to graphically ease the specification of sections within a course. We used the following DSM tools: EMF (main metamodel-oriented framework) and GMF (graphical framework). A full-generated prototype, as a plug-in for Eclipse has then been generated by the DSM tools in accordance with the domain and graphical objectives. Concretely, this prototype is a simple application providing a drawing space in which graphical and inter-related course sections can be modeled (Fig. 2).

This editor does not require computer skills: the teacher/designer has to use the functionalities offered by the tool palette to graphically specify a diagram representing the course. He defines all the course sections by creating them and filling some information fields (activity name, summary, etc.). He draws some links between sections for defining the learning sequence. The scenario is serialized in an XML machine-readable format.

For allowing the implementation of the scenarios we have developed a block (e.g. a specific functionality added to Moodle author environment) which parses the XMI file and creates all the concepts composing the Moodle course, according to the scenario elements. It plays the role of a communication bridge between the external editor and Moodle. This block appears in the course screen

in design mode. The teacher has not anymore to deal with the different interfaces previously needed for specifying a course: he has just to choose the file to import. After this importation step, the sections, title and orders are directly set-up within the space course.

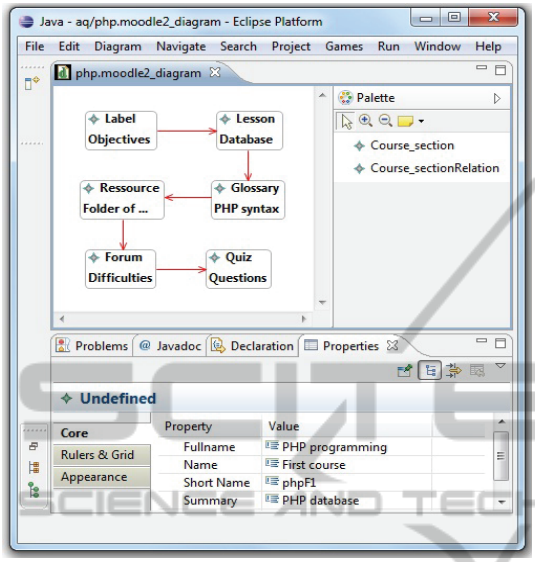

Figure 2: The external graphical editor.

5 ON GOING WORK

For going farther this first result, we actually work on two directions: defining more complex VIDLs for Moodle and evaluating the usability of the editors built on them. We also aim to study at least one another LMS, to repeat our proposals (e.g. defining externals editors of pedagogical scenarios) in order to evaluate the possibilities of interoperability between two different technical frameworks, helped by Model Driven Engineering techniques.

REFERENCES

Abdallah, F., Toffolon, C., and Warin, B., 2008. *Models transformation to implement a Project-Based Collaborative Learning (PBCL) Scenario: Moodle case study*. In 8th IEEE International Conference on Advanced Learning Technologies, Spain, July 2008.

Berggren, A., Burgos, D., Fontana, J. M., Hinkelman, D., Hung, V., Hursh, A., and Tielemans, G., 2005. *Practical and Pedagogical Issues for Teacher Adoption of IMS Learning Design Standards in Moodle LMS*. In Teacher Adoption of IMS Learning Design Standards in Moodle LMS. Journal of Interactive Media in Education, 2005.

Botturi, L., Todd-Stubbs, S., 2007. *Handbook of Visual Languages for Instructional Design: Theories and Practices*. Information Science Reference. ISBN-13: 978-1599047317.

Caron, P. A., Derycke, A., and Le Pallec, X., 2005. *Bricolage and Model Driven Approach to design distant course*. In E learn 2005, world conference on E-learning in corporate Government, HealthCare & higher education.

Ghiglione, E., Dalziel, J., 2007. *Design principles for LAMS version 2 and the LAMS "Tools Contract"*. In Proceedings of the TenCompetence Conference Workshop. UPF - Barcelona, Spain.

Hernández-Leo, D., Villasclaras-Fernández, E. D., Jorrín-Abellán, I. M., Asensio-Pérez, J. I., Dimitriadis, Y., Ruiz-Requies, I., and Rubia-Avi, B., 2006. *Collage, a Collaborative Learning Design Editor Based on Patterns Special Issue on Learning Design*, Educational Technology & Society. 9(1), pp. 58-71.

Kelly, S., Tolvanen, J.-P., 2008. *Domain-Specific Modeling*. ISBN: 978-0-470-03666-2. Paperback. 427 pages. Wiley-IEEE Computer Society Press.

Koper, R., 2006. Current Research in Learning Design. Educational Technology & Society, 9 (1), 13-22.

Laforcade, P., 2010. A Domain-Specific Modeling approach for supporting the specification of Visual Instructional Design Languages and the building of dedicated editors. Journal of Visual Languages & Computing, Volume 21, Issue 6, Pages 347-358.

Martel, C., Vignollet, L., Ferraris, C., David, J.-P., and Lejeune, A., 2006. *Modeling collaborative learning activities on e-learning platforms*, In: Proceedings of the Sixth IEEE International Conference on Advanced Learning Technologies, pp. 707-709.

Martinez-Ortiz, I., Sierra, J. L., and Fernández-Manjón, B., 2009a. Enhancing IMS LD Units of Learning Comprehension. In the 4th International Conference on Internet and Web Applications and Services. May 24-28, 2009, Venice, Italy.