THE CLASSIFICATION OF E-LEARNING RESOURCES METADATA: A PROPOSAL

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Abstract: In the paper we present our proposal of identifying and classifying e-learning resources metadata. The research is based on the analysis of the results of a special questionnaire that we have developed to evaluate e-learning resources. During the analysis we identified and then categorized several items of information that proved to be essential; we especially focused on the quality and the reuse potential (reusability).

We compared those information items with the definition of metadata in the SCORM 2004 standard to find out which of them are new and which are already available in the standard. The main contribution of the paper is the definition of the most important of our metadata categories: *Didactics*, *Evaluation*, *Reusability*, *Quality*, and their elements. As we will show, a lot of the elements are new. In our opinion, they could become a useful part of the SCORM standard.

1 INTRODUCTION

One of the main e-learning issues is, apart from creating content, defining metadata for that content. Such metadata are useful both for the learner (e.g., to get important information about a learning resource before buying it and about technical support when using it) and for the authors of e-learning resources (to provide the learner with such details). In consequence, metadata are a part of e-learning standards, in particular the SCORM 2004 standard (ADLNET, 2004).

Despite, or rather because of, putting metadata into SCORM and other standards, the issue is still under research. In the paper we would like to present our proposal of how to classify e-learning metadata. The classification is based on the analysis of data that we have collected with the help of a special questionnaire – the questionnaire was filled out by users of various e-learning resources. During the analysis we identified, and then subdivided into groups, several information items that proved to be an essential part of their description. Those groups/categories are the following: *Basic Specification*, *Didactics*, *Evaluation*, *Functionality*, *Usability*, *Environment*, *Formal Requirements*, *Reusability*, and *Quality*. We also compared elements of our groups with the metadata defined in

SCORM 2004 to find out which of them are new and which are already available in the standard.

Due to space limit, in this paper we concentrate only on the most important of our categories: *Didactics*, *Evaluation*, *Reusability*, and *Quality*. The remaining categories will be discussed in other publications.

As we will show, a lot of the elements that we have identified are new, that is, they do not exist in the SCORM standard. Moreover, the other elements are usually modified. In our opinion, both the new and modified elements increase the usefulness of e-learning resources metadata and therefore they would be a useful part of the standard.

The paper is organized as follows. In Section 2 we discuss the main four categories. Some elements of the other categories are presented in Section 3. Section 4 concludes the paper and outlines some ideas for our future work.

2 THE NEW METADATA CATEGORIES

In this section we present in detail our four most important new metadata categories and their elements. In order to make the presentation as readable as possible, the specification of each

category has a table format; such a table has the following columns:

- The *Element* column specifies the names of the elements for a given category. Some elements are *parent elements* (as in the SCORM standard) – in such a case the column has a *Child Element* subcolumn.

- The *Description* column has the textual description of the elements.

- The *Value Type* column specifies the value type for the elements. For some elements we use types from the SCORM standard, for the others we define our own types. If an element is a parent element (has no value associated with it), then its *Value Type* field is blank.

- The *Mult* column specifies the multiplicity requirements for the elements.

- The *SCORM Cat/El* column specifies whether a given element is a part of the SCORM standard. If it is not, then the appropriate field of the column has the "none" value. Otherwise, the corresponding SCORM category/element is specified. We use the dot notation *Category.element$_1$.element$_2$. ... .element$_n$*, where *element$_k$* denote subsequent elements and child elements for the *Category*.

- The *Weight* column specifies the weights for the elements. This column is defined only for the table for the *Quality* category.

2.1 The *Didactics* Category

The *Didactics* category provides metadata for describing the conformance of the structure of an e-learning resource to the *model of effective learning* (Allesi & Trollip, 2001). The model utilizes two basic learning paradigms: knowledge delivering (lecture-based learning) and knowledge creating (problem-based learning); its basic idea is to give equal importance to both of those paradigms. We have applied this idea and developed a proposal for the structure of a good e-learning resource; the structure is presented in Figure 1.
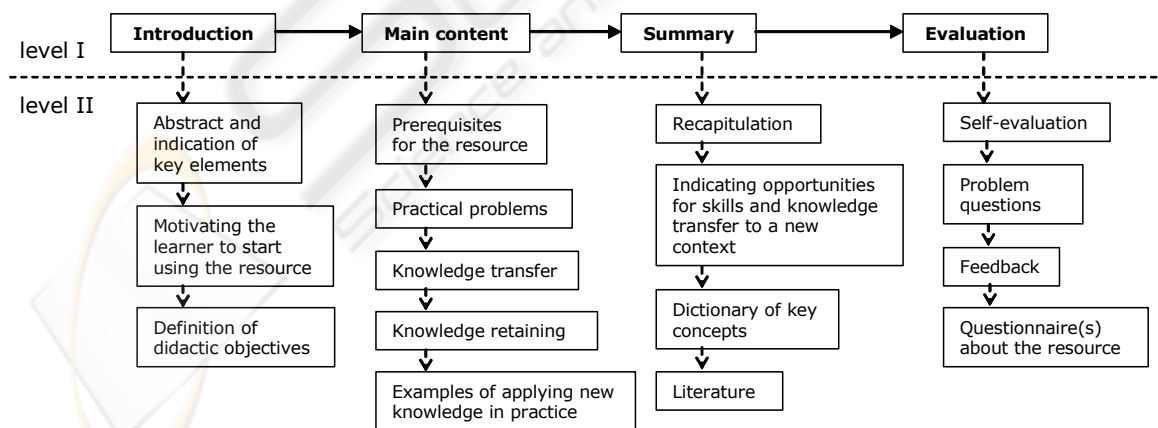

Figure 1: The structure of a resource conformant to the model of effective learning.

| Element | Description | Value Type | Mult | SCORM Cat/El |
Child Element				
structure	The conformance of the resource to the model of effective learning (based on the order and the proportions between the didactic components of level I and level II).		0 or 1	none
modelConfLevel_I	The conformance to the model – for level I.	{very good, good, sufficient, insufficient, no conformance}	0 or 1	none
modelConfLevel_II	The conformance to the model – for level II.	{very good, good, sufficient, insufficient, no conformance}	0 or 1	none
quality	The quality of the didactic components.	{very good, good, sufficient, insufficient}	0 or 1	none
learningParadigm	The prevailing learning paradigm used by the authors of the resource.	{lecture-based, problem-based, balanced}	0 or 1	none
learningTime	The expected (by the author of the resource) time that the learner needs to work through the resource.		0 or 1	*Educational. typicalLearn ingTime*
effective	The effective time (in hours).	*Duration Data Type*	0 or 1	none
continuous	The time may include pauses (in days).	*Duration Data Type*	0 or 1	none

2.2 The Evaluation Category

The *Evaluation* category provides metadata for the evaluation methods of:

- the results of the learning process (it concerns the learner);
- the usefulness and quality of the resource itself.

Element Child Element	Description	Value Type	Mult	SCORM Cat/El
selfEvaluation	The tools supporting the learner's self-evaluation.		0 or 1	none
simulation	The kinds of simulation supporting the learner's self-evaluation.	{case studies, role playing, games, guided analysis}	0 or More	none
drillAndPractice	The kinds of questions supporting the learner's self-evaluation.	{one-choice questions, multiple-choice questions, matching, jigsaw puzzles, open questions}	0 or More	none
problemQuestion	The questions for the conceptual context of group problem-solving.		0 or 1	none
solving	The questions for testing the ability to solve the problems discussed in the resource, but in a new context.	{good quantity, sufficient quantity, insufficient quantity, no questions}	0 or 1	none
isolating	The questions for testing the ability to isolate the characteristics of the beginning situation and of the expected situation.	{good quantity, sufficient quantity, insufficient quantity, no questions}	0 or 1	none
evaluating	The questions for testing the ability to evaluate the solutions proposed by others.	{good quantity, sufficient quantity, insufficient quantity, no questions}	0 or 1	none
substantiating	The questions for testing the ability to substantiate the solutions of the problems.	{good quantity, sufficient quantity, insufficient quantity, no questions}	0 or 1	none
questionsStrategy	The strategy of choosing questions.	{fixed sequence, random, previous-answers driven, mixed, no questions}	0 or More	none
feedback	The existence of a feedback mechanism.		0 or 1	none
corrAnswFeedback	The existence of correct-answer feedback.	{yes, no}	0 or 1	none
auxQuestFeedback	The existence of auxiliary-questions feedback.	{yes, no}	0 or 1	none
reporting	The existence of evaluation reporting.	{yes, no}	0 or 1	none
questionnaire	The possibility to evaluate the resource with the help of a questionnaire (e.g., questions about its quality).	{yes, no}	0 or 1	none

2.3 The Reusability Category

The *Reusability* category provides metadata for describing the reuse potential of the resource, that is, the possibility to use it to create another e-learning resource.

Element		Description	Value Type	Mult	SCORM Cat/El
	Child Element				
useContext		The description of the context(s) in which the resource can be used.	*CharacterString Data Type*	0 or More	none
relation		Links to other resources related to the resource.	*Link Data Type *)*	0 or More	*Relation*
platform		The platforms on which the resource has been tested.	*Platform Data Type *)*	0 or More	none
standard		The information about the standard(s) that the resource is conformant to.		0 or More	none
	name	The name of the standard.	*CharacterString Data Type*	0 or 1	none
	certificate	The name of the certificate granted.	*CharacterString Data Type*	0 or 1	none
	date	The date on which the certificate was granted.	*DateTime Data Type*	0 or 1	none
	body	The body that granted the certificate.	*CharacterString Data Type*	0 or 1	none
contactInfo		The (author, technical support etc.) contact information necessary to use/reuse the resource.	{very good, good, sufficient, insufficient}	0 or 1	none
reference		The information on the persons/institutions that recommend the resource.	*Reference Data Type *)*	0 or More	none
user		The information on the persons/institutions that have used or are using the resource.	*User Data Type *)*	0 or More	none
opinion		A list of opinions about the resource by its users.	*Opinion Data Type *)*	0 or More	none

*) Our data type; to be defined.

2.4 The Quality Category

The *Quality* category provides metadata for describing the quality of the resource.

Currently, the weight of each element influencing the quality of the e-learning resource as a whole is 1. We plan to perform new statistical research on the data that we are collecting with a new version of our questionnaire; one of the objectives is to establish real values for the weights.

Element	Description	Value Type	Mult	Weight	SCORM Cat/El
basicQuality	The quality of the resource with respect to the following categories: *Basic Specification, Didactics, Evaluation, Functionality, Usability, Environment, Formal Requirements, Reusability*.	{very good, good, sufficient, insufficient}	0 or 1	1	none
searchSupport	The support to find information on the resource with the help of the resource's key words and classification (the metadata describing the resource's keywords and classification are part of the *Basic Specification* category).	{very good, good, sufficient, insufficient}	0 or 1	1	none
userSatisfaction	The average satisfaction level of the previous users of the resource.	{very satisfied, satisfied, dissatisfied, very dissatisfied}	0 or 1	1	none
expertAppraisal	The information on the expert appraisal of the resource by independent experts and/or authorizing bodies.	*ExpertAppraisal Data Type* *)	0 or More	1	none
patternConformance	The conformance degree of the resource to the *pattern resource*, that is, to the resource where the quality of the resource with respect to our eight categories (from *Basic Specification* to *Reusability*) is considered to be optimal. This element is a *derived* one.	{very high, high, low, very low}	0 or 1	1	none

*) Our data type; to be defined.

3 THE OTHER METADATA CATEGORIES

Below we list some elements of the other categories in our proposal:

- the *Basic Specification* category includes elements such as: *name, version, keyWord, classification, publicationDate, workMode, skillsLevel*;

- the *Functionality* category includes elements such as: *multimediaKind, externalResource, update, interactionElement, auxiliaryElement*;

- the *Usability* category includes elements such as: *navigation, search, importExport*;

- the *Environment* category includes elements such as: *requirement, technicalSupport*;

- the *Formal Requirements* category includes elements such as: *license, warranty, cost*.

4 SUMMARY AND FUTURE WORK

In the paper we have presented the findings of our research on e-learning resources metadata. In the research we have used a special questionnaire with the help of which we collected data from users of e-learning resources. The performed analysis enabled us to identify several information items useful for describing them. We have subdivided those items into groups/categories – some of them are similar to those in the SCORM 2004 standard (although usually modified), some are new. Due to space limit, in the paper we focused on the following main categories: *Didactics*, *Evaluation*, *Reusability*, and *Quality*. We believe that the elements of our categories, especially *Reusability* and *Quality* which involve issues known in other IT areas (e.g., software engineering), could prove valuable for the SCORM standard.

Our proposal requires more work, for instance, we are working to fully incorporate the elements and categories identified in our research into the SCORM standard. We are also constructing a new, more advanced version of our questionnaire to gather more precise data from e-learners.

REFERENCES

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