An improved result model for scenarized learning activities

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An Improved Result Model for Scenarized Learning Activities

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Abstract: - This paper presents a result model which expresses results provided by a pedagogical activity described with a scenario. Nowadays, the need of a result model appears in scenarized infrastructure so as to allow the assessment of learners during scenarized activities. This model is specific from scenarized activities. It takes into account the scenarization context and others typical elements of pedagogical activity like skills. This model has been designed and tested with the Learning Design Language (LDL) and its infrastructure LDI. LDI is a scenarization infrastructure which allows the expression of assessment scenarios. An assessment scenario describes an assessment activity which uses results coming from a scenarized learning activity.

Key-Words: - Result model, scenarized learning activity, Learning Design Infrastructure/Language (LDI/LDL).

1 Introduction

Scenario infrastructures (LDI [1], RELOAD[1], LAMS[2]) today offer great freedom to design learning activities according to the wishes of the teachers [2]. In this rich pedagogical context, the assessment of the learners should be also open and free. But it is not the case. Indeed in this context, the assessment of the learners is resumed by tests. There's a confusion between test and assessment [3]. But if we look at ILE (Interactive Learning Environment), there are a lot of assessment types: skills assessment [4][5], self-assessment [6][7], participation assessment [8], etc…

In a scenarized activity, assessment is only viewed by the use of results coming from tests (like IMS-QTI[3] tests) to manage the course of the activity.

In previous papers, we have proposed to scenarize assessment in assessment scenario [9][10]. But an assessment scenario needs so as to evaluate a learner, to use results from a learning activity. This paper focuses on a result model and a formalism which we have designed to express results of a learning activity. Firstly, the context of our research domain is introduced and in particular, the Learning Design Language[1] is presented. We expose then, the diversity of results that we wanted to express. After a quick introduction of other works on activity trails, the result model is presented and detailed. Finally, an example of use of the model in LDL is detailed before that we conclude.

[1] RELOAD : http://www.reload.ac.uk/
[2] LAMS : http://www.lamsinternational.com/
[3] IMS Question and Test Interoperability : www.imsglobal.org/question

2 Context

The research contribution we present in this paper takes place in the field of scenarized learning activities and their assessment. This proposal is based on a particular scenario language: the LDL language.

2.1 What is a scenario?

A scenario is the specification of a future learning activity which becomes a "scenarized activity" expressed in a scenario language such as IMS-LD[4] or LDL [1]. To create a corresponding activity in a targeted environment, a scenario has to be "operationalized". This consists firstly in choosing the participants, then attributing roles foreseen by the scenario to the proper participants, and finally selecting the services and contents required by the scenario. The execution of the operationalized scenario will provide the learners, teachers, tutors, etc. with the means (resources, services, tools, etc.) to take part in the activity. Other activities may take place simultaneously within the scenarized activity; we call these "spontaneous activities". Given their unpredictable nature, they cannot be specified in any scenario, neither can they be controlled or followed.

2.2 LDL

The LDL language allows to describe a learning activity in the XML format. This language is made of several concepts. In this section we only describe the main concepts of LDL (*cf* Figure 1).

[4] IMS Learning Design : http://www.imsglobal.org/learningdesign/index.html

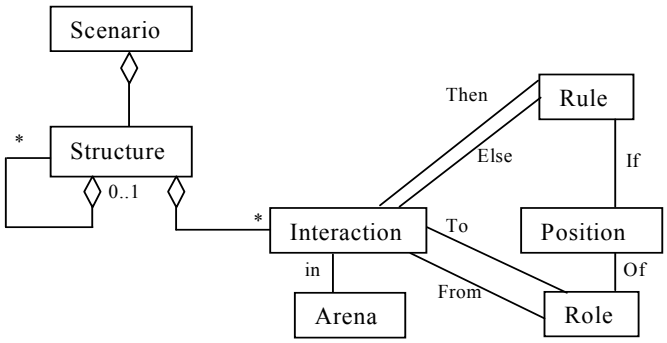

Figure 1 : LDL simplified representation

2.2.1 Activity structure

In LDL, a structure specifies the order in which the interactions will be played. Three types of structure exist:

1) the "sequence" in which the interactions play one after the other;

2) the "selection", in which certain interactions are chosen from the set of interactions and played in sequence;

3) the "all" structure, in which all the interactions will be played without a predefined order.

A structure can contain other structures. The way to gather structures depends on the phases the designer of the scenario has specified. We consider the structure as the backbone of the scenario.

2.2.2 Participant interactions

The interactions fit into the structures previously described. They specify the exchanges the participants will have during the learning activity. They usually consist of verbal communication, document exchange and collaborative productions. They are situated: they occur in contents or via services. These interactions depend on the capacity of the places where they occur (for instance, a content can be read, a service can offer communication functionalities, etc.)

In its simple form, an interaction is an action from one participant to another in a specific place. The initiator is called "the addresser", the other is called the addressee. The place where the interaction takes place is "the arena".

The type and the number of interactions reflect the degree of cooperation between the participants. In our meta-model, an activity is reflected by an interaction. Thus, LDL is "intrinsically cooperative" in the sense that the activities modeled are based on participant cooperation.

2.2.3 Participant roles

In a scenarized activity, participants have "coherent" interactions. For example in a learning activty, the ones who read the course, do the exercises and take the examination are the learners. The ones who write the course, annotate a piece of work and mark an examination are the teachers.

A set of interactions reflects a "thematic" role. Thus, in LDL, a role is defined by its corresponding set of interactions.

During the performance of an activity, a participant's actions will be limited by the interactions which define her/his role.

2.2.4 Activity arenas

The activity arenas specify the places where the activity will take place: a service or a content. A forum, a search engine or a chat room are considered as service arenas. A course, an exercise, a photo album or a web site are content arenas. This spatialization guides the modeling and delimits the interaction perimeter. Participants interact in these arenas through the interactions specified by their roles.

2.2.5 Rules

The LDL concepts described above facilitate the design of learning activities in which participants receive instructions as to what they have to do. We propose to add the means to allow the adaptation of the activity's performance with regard to the participants' reactions.

To do so, the model includes rules. Rules are used to define the start and the end conditions of interactions and structures. They are also used to personalize the learning activities according to what we call participant positions. For instance, a rule can be defined to propose complementary lessons to a learner who has declared that s/he is not able to do an exercise.

2.2.6 Individual positions of the participants

A position is a general concept which covers different notions such as: participant point of view, her/his availability, the difficulty of an activity, a mark, etc. It represents the value a participant associates with an activity concept.

The position value is tested in the conditional part of the rules. As rules control the activity's progression, participants can influence this progression through their positions.

2.2.7 Observables

Simply to know what is going on, the participants need observation points. We have introduced the concept of "observable". For instance, the following entities are observable: interaction state (visible, started, stopped,

etc.), structure state (visible, started, stopped, etc.), progress of the participant in the activity.
Observables are used to build different views on what is going on. For example in a learning activity, teachers can use this view to know who is having difficulties in which exercise. An observable can also be referenced by the scenario itself, as a position. A rule condition can refer to an observable. For instance, a rule could be: if a learner starts to prepare for an examination even though s/he has never sent any exercises, then notify the teacher.

2.3 Assessment and Scenarization

Practices of assessments are relatively rich in ILE. However there are few types of assessments within the framework of scenarized activities. For example in the case of the IMS-LD language, assessment does not take part of the description of the learning activity. There is no specific object which allows to describe the assessment desired within the scenario. Assessment is left with the load of the tools used during the learning activity. IMS-LD makes it possible to describe results obtained from these tools. In other words, to describe the grade obtained by a student in a multiple-choice questionnaire IMS-QTI. This score is expressed in IMS-LD language by a property. The value of this property (property-value) can be used under conditions to redirect learning towards one activity or an other, described by the scenario. However, as exposed previously ILE student's assessment does not provide only summative test of learner(s) [3].

2.4 Assessment Scenario

Modeling assesment with the help of a scenario requires, for us, to take the assessment practices in ILE into account. Indeed, assessment is a natural and social activity [11]. It is possible, in the way that it exists in ILE, to scenarize assessment activity just like a learning activity [9] [10]. In this case an assessment scenario describes an activity which evaluates results provided by a learning activity. But what are these results?

3 What Kind of Results?

3.1 The Diversity of the Results

In order to illustrate this diversity (i.e. the range of results that a scenarized learning activity can produce), we focused on various activities that we scenarized and implemented. We will briefly present them.

3.1.1 A Remediation Activity

This remediation activity is made up of three activities, each described by a scenario: an answer scenario, an assessment scenario and a remediation scenario. In the answering activity, the learner answers a succession of questions and carries out simulations of electrical circuits. The assessment activity evaluates the answers to the questions and in the event of an error, it returns to a remediation activity made up of a lecture and questions. Once the remediation activity is finished the answering activity carries on.

3.1.2 An Activity of Long Duration

A "long life" scenario , i.e. a scenario of long duration, can scenarize an activity of a one year distance learning course such as those proposed by the CNED (French national center of distance learning). During this type of course the learner has access to resources. He/she must complete his/her work and return it as mail, text files, images, etc.

3.1.3 A Group Search

In our treasure hunt, groups of learners search for the name of a famous person. Clues are hidden in various documents. The members of the same group are physically distant; they organize their group research and communicate within a chatroom.

3.2 Typology of Results

Taken as a whole, these activities provide our typology of possible results:

- The remediation activity offers results of simulation, the results coming from a QTI-like questionnaire.
- The "longlife" activity provides results of the deliverable type which can be files, and/or files deposited in a shared space.
- The group search, introduces the results which are a product of the communication and the coordination of the participants. There are results such as their interventions in a forum. Results which make it possible to evaluate their participation in the activity.

All these scenarios have results relating to the learners' navigation the activity. For example the number of accesses to an arena, or the duration of the reading of an instruction can also be the subject of an assessment (for example the assessment of a statement reading).

But results provided from a scenarized learning activity, have to be associated with the scenarization context and the pedagogical issue of the activity. If we take a look at

the pedagogical dimension of a learning activity, the notions of knowledge, competences, appears [12].

3.3 A Pedagogical Context

A result is the illustration of a competence which is used during the performance (ie the scenarized activity) [13]. This is this competence which is assessed when the result is evaluated.

4 To Obtain Results

4.1 Classical Track's Management

In the literature, what we call in this paper results are called learning indicators in the search area of tracking and analyzing usages [14]. Generally, a learning indicators (*cf* figure 2) is a structured primitive trails. A primitive trail is the result an initial collect of events, actions of a learning situation (mouse click, time of the activity beginning, etc.), etc.

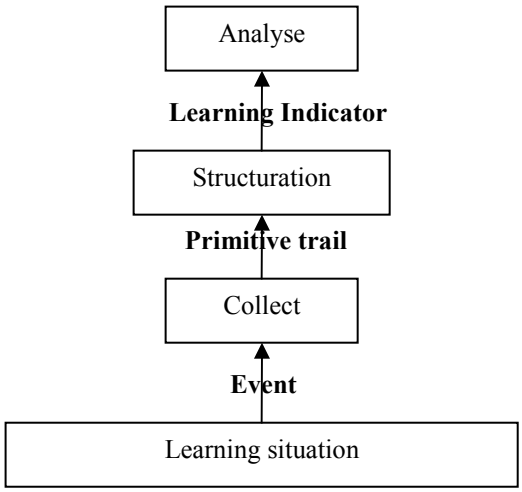

Figure 2 : Track's management general process

Most of the time, events produced by a learning situation are collected in a log file [15]. The log file gives primitive trails that are structured in learning indicators.

4.2 Result Management

During a scenarized activity, resources (Web pages, etc.) and services (Chatroom, QTI-player, etc.) are handled by the participants of the pedagogical activity. These services provide several types of results as we have seen previously.

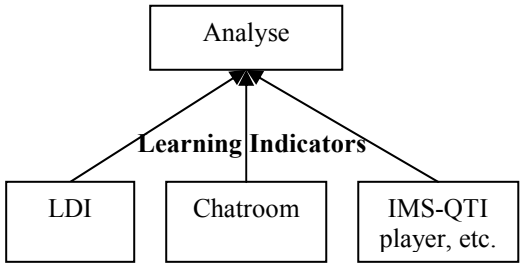

Figure 3 : Track's management process in a scenarization infrastructure

In this context, we can directly have structured trails from the used services (*cf* figure 3). There is no need to collect events and primitive trails, many services provide naturally learning indicators. There is just to define a common learning indicator format, i.e. common result formalism to exploit these results.

5 Existing Result Models

There are a certain number of result formalisms, even if the result part not always does represent the principal object of the specifications. Indeed, in the IMS-LIP[5] model, the objective is to specify an XML formalism to express the profile of a learner. IMS-LIP deals with results only in the part which is dedicated to the results of assessment. IMS-QTI Result Reporting[6] specifies a formalism of results obtained by a learner during an IMS-QTI test session. As well as the scenario devices allow only one restricted vision of assessment based on MCQ, IMS result formalism expresses almost only results resulting from MCQ.

Cool Mode [15], a collaborative software tool, proposes a result formalism based on XML which allows to express results from a collective problem-solving activity so as to build a user profile. This formalism is specific to the software and can not express the results diversity wished.

Usage Tracking Language (UTL) [17] is a meta-language which allows to express many types of results. This meta-language is not a Domain Specific Language (DSL), UTL can generate DSL. But UTL does not exempt to define the results semantic which are wished. We will certainly use UTL, in future works to compare the result model created with UTL, with the result model presented here.

[5] IMS-LIP : www.imsglobal.org/profiles
[6] IMS-QTI Result Reporting : www.imsglobal.org/question/qtiv1p2/imsqti_res_infov1p2.html

Formalisms and models, we studied, were not appropriate for our needs (diversity of results, and simplicity to design).

6 The Result Model

6.1 Expression of the Results Diversity

We do not claim that our model is complete as for the types of results which can be obtained from a scenarized learning activity. The ambition of this model is to allow the expression of the most common results, like those seen previously.

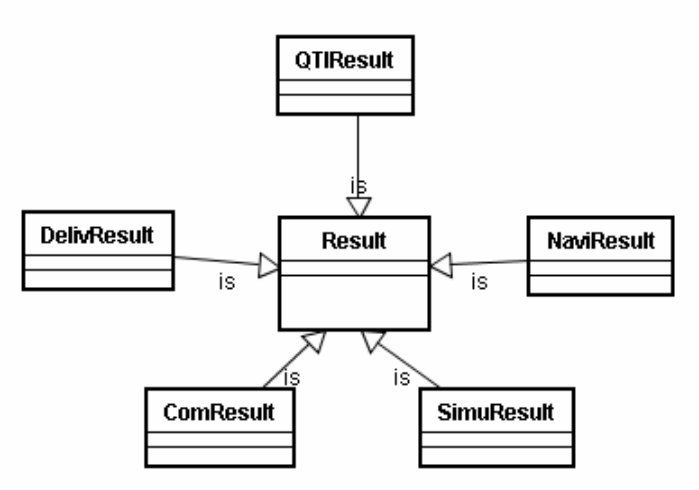

Figure 4 : Types of results.

In figure 4 we find the diversity of the results produced by the various activities which we scenarized. We have the deliverables (DelivResult), the results of communication (ComResult), the results coming from a simulation (SimResult), navigation of learning in the activity (NaviResult), and the results resulting from MCQ (QTIResult).

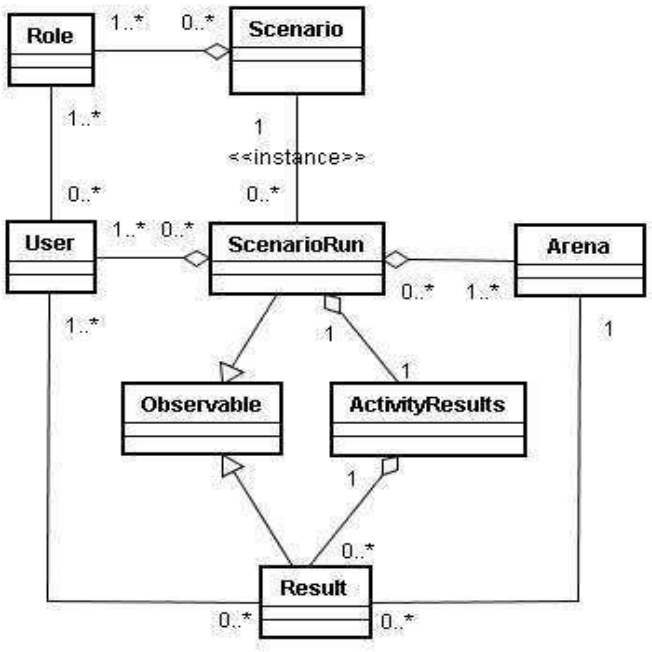

Figure 5 : Simplified view of the model

Each one of these results is observable by the infrastructure (observer-observable design pattern). This characteristic is usable within the framework of an assessment scenario within a position. A result is produced in an arena which is specified at the instantiation of the scenario (Scenario) and used during the activity (ScenarioRun). During an activity a great number of results can be generated (ActivityResult). A result is produced by participants who have a role. The model of result suggested takes again the concept of arena resulting from LDL. This concept is taken again with different names the other languages of scenario. IMS-LD speaks about "learning Object" and service. The model is therefore not specific to LDL.

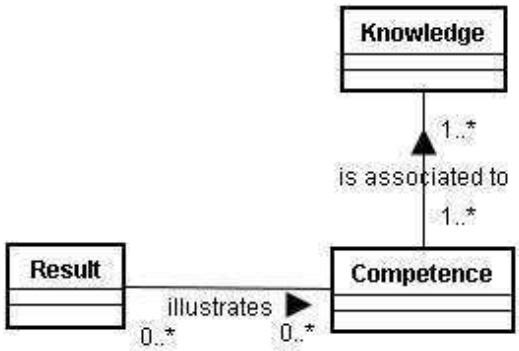

Figure 6 : A result illustrates competences

In the Figure 6 we can see that the result model take into account the pedagogical context with a result can be associated. A result can be seen as the illustration of a

competence which is used during the performance (i.e. the scenarized activity) [13]. The word “competence” is used in a general sense; it means also here, capacity, ability our capability.

7 Use of the Result Model

7.1 A Result Expression

In order to express results the model has been carried out in the XML format. The results are stored by the scenario infrastructure in an XML database. As we have seen, these results come from the arena handled during the learning activity.

```
<ScenarioRun>
<Scenario>……</Scenario>
<Arenas>…….</Arenas>
<Users>…...</Users>
<ActivityResults id="1">
        <QTIResult id="r1">
                <date>22/10/05 15H06</date>
                <description>Answer first Question
                </description>
                <competences>…</competences>
                <arenaref>Question1</arenaref>
                <userref>user1</userref>
                <result>12</result>
                <solution>20</solution>
                <score>0</score>
                <scoremax>10</scoremax>
                <scoremin>0</scoremin>
        </QTIResult>
</ActivityResults>
</ScenarioRun>
```

The highest element in the XML hierarchy of the model is the ScenarioRun object which integrates all the others: Scenario, Arena, Users, and ActivityResults. In the example the learner "user1" gave the answer 12 to the question “Question1” whereas the right answer was 20.

This result illustrates the ability to the user to write the multiplication table 4. So as to be able to realize this exercise, the learner has to know the properties of multiplication.

```
<competencies>
        <competence>
                <name> To write the
                multiplication table 4.
                </name>
        <knowledges>
                <knowledge>
                  <name>Properties of
                  multiplication.
                  </name>
                </knowledge>
        </knowledges>
        </competence>
</competencies>
```

This result is usable in an activity of assessment.

7.2 Use of a Result in an Assessment Scenario

Indeed, in LDL, it is possible to define positions which point to observables (*cf* part 2.2.7). However, in our results model, any result is observable. The expression of a result and its uses is then possible thanks to the positions. Below is the expression of a position which points to the answer to a QTI question.

```
<Position id="first_answer">
        <title> Response first question</title>
        <valeur>
          <Observer id="QTI">result</Observer>
        </valeur>
        <sur>Question1</sur>
        <de>learner </de>
</Position>
```

Once the result is described in the scenario, within a position, it is possible to define treatments on this position in the scenario. In our case the treatment is an assessment carried out during an interaction by a human or software participant. The correspondence between the result described by the position, and the result obtained during the activity is managed by the scenario infrastructure.

8 Conclusion

This paper has detailed the result model that we have defined during the implementation of assessment scenarios. This result model will be soon improved and tested. The objective of the experimentation is to check the relevance of the model in the carrying out of assessment. As it exist several standards to express an activity (IMS-LD, LDL), a questionnaire (IMS-QTI), a standard to express results from scenarized learning activities is needed. The presented model still has to evolve but it could be the basement of a new result standard.

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