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MODELS FOR The RE-USE OF LEARNING SCENARIOS

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Summary: The aim of this paper is to contribute to increased reuse of pedagogical scenarios by teachers and trainers. We focus on the educational modelling languages framework, and propose a life cycle model for learning scenarios and describe the different aspects of a learning scenario through a second model. We also look at the functions that could be made available to users within new computer based environments.

Keywords: learning scenario, educational modelling language, IMS LD, computer based learning , artifacts, sharing, communities of practice.

Models for the re-use of scenarios of training

INTRODUCTION

Problems of learning design carried out by the teacher currently occupy a strategic place in the field of ICT in education. Having looked at the creation, sharing and reuse of resources, (Parquette 2002, 2004, Pernin 2003, Crozat 2002) emphasis in the field of pedagogical engineering is now on learner activity as opposed to pedagogical content. The main focus is on reuse and sharing between educational professionals not only in terms of resources but also of pedagogical know how in a learning context.

The recent emergence of educational modelling languages go some way to answering these needs by proposing a formalisation of relations between actors, activities, resources, tools and services. IMS LD[1] appears to act as a way of standardising such languages. New artefacts aimed at implementing this specification are beginning to appear and will eventually give rise to new teaching and learning design practices. The success of these artefacts depends not only on their ergonomic quality but also on the appropriateness of underlying concepts of users practice and representation.

Rabardel's theory of the "development instrument" is based on psycho-educational trends which focus on activity. An instrument is defined as a product of user interaction with a system. The instrument constitutes a psychological reality which is contextualised and social in nature. The design process is not just about providing systems to users. Instead, artefacts are suggestions that individuals can decide to build on if they choose. The design process should be organised around pre-existing practices and should provide a flexible system which can be adapted to their needs. Creativity should be a characteristic of the design process and not considered an attempt to rework a dysfunctional artefact. The organisation of the learning design process is more effective when it

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[1] Referred to more simply as IMS LD in the rest of this article

alternates design phases with implementation. This approach leads to one of the main principles in e-learning: to build something that fulfils the social needs of training in collaboration with users in a given context

The aim of this paper is to contribute to the development of a conceptual framework allowing for the design and the evaluation of and a strong focus on eLearning artefacts intended to manage pedagogical scenarios. IMS LD seems to be an exhaustive information model as opposed to a methodology allowing for the progressive introduction of tools whilst catering for the needs of various learner types. Two things seem to be missing:

1) An explanation of evaluation, use and the development process
2) The breakdown of an LD into logical facets that can be mapped to usual practices.

In the first instance we will examine the sharing practice of designs. We underline two frequent deficiencies in relation to the aforementioned solutions. On the one hand there is a low degree of formalisation of designs which are often described in free text, This makes them difficult to appropriate. On the other hand there is the difficulty of modifying and reusing "ready to use" designs.

In the light of these observations, the second part of the article looks at recent efforts to formalise designs in terms of modelling languages, IMS LD in particular. In putting forward a generic language to describe learning situations, IMS LD gives a glimpse into the possibility of auto-management of designs. We compare IMS LD to a design taxonomy which we put forward

in a previous paper. (Pernin&Lejeune2004).

The third part of the article presents a generic model of the life cycle of designs which can also be applied to traditional learning situations as well as eLearning. Having outlined four distinct phases: Design of the scenario, contextualisation of the Scenarios, use of the scenario and reuse of the scenario, we put forward a number of steps intended to enrich the different facets of the design.

In the fourth section we turn to look at the use of computer technologies in relation to the model we put forward. We focus in particular on automatisation and/or assistance to the user for four different facets of the design eg: design, run, observation and regulation. Each of these possibilities relate to different approaches respective of the technological environment, human tutoring or reflexive approaches to learning.

To finish we outline the prospects for research to which our propositions give rise. We focus on the need to reuse strategies at the heart of communities of practice. This assertion will take account of the gradual integration of computer based artefacts to meet identified needs.

1. Practices of sharing resources and designs.

For nearly ten years important research has been conducted to come up with descriptive models and ways of categorising digital learning objects. As pointed out in a previous article (Pernin&Lejeune, 2004b) two major

approaches can be identified; the documentalist approach promotes sharing and resue of objects based on a teaching model of sourcing, referencing and aggregating resources. The second approach is activity based and puts forward the model of teacher as designer. This work has resulted in the development of proposals of standards concerning languages of data indexing (LOM), computerised implementation models (SCORM) and lastly pedagogical modelling languages (IMS LD) (Pernin 2003).

Parallel to this work, new internet tools have resulted in the emergence of new communities of practice. To illustrate this we can point to a group of communities in France in the field of secondary education which featured in an important census conducted by the ministry of education through the Educnet website (Educnet).
It is interesting to compare the actual activity of these communities with hypotheses based on documentalist and activity-oriented approaches. Do the basic needs of practitioners push them to share resources and know how? Do they feel it is necessary to share typical scenarios and detailed descriptions of the playing out of pedagogical sequences? Is there a link between the academic subject and the kind of sharing that takes place e.g. knowledge resources, links, exercises, sequences etc.

The answer to these questions lies in an in-depth study that identifies the appropriate variables.

In this article empirical analysis of sites presented on Educnet raises the following points:

- There are as many sharing practices as there are UoLs
- There's a big gap between disciplines in sharing approaches that favour resources or activities.
- a significant number of scenarios describe learning situations which don not use digital technologies
- in the case of sharing scenarios, activity description sheets are often offered. These forms, often in various formats, provide information such as the name of the author, the target audience, the duration, the pedagogical aims, the necessary resources etc.
- many shared designs correspond too closely to defined objectives with the result that they cannot easily be used in other contexts

At this point we point to two frequently occurring deficiencies in the solutions proposed. On the one hand the varied nature of the formalisation of scenarios is often limited to free textual descriptions or specific formats which make it difficult to use. On the other hand, the difficulties associated with modifying ready made scenarios makes their use in other situations difficult.

2. SOLUTIONS OFFERED BY PEDAGOGICAL MODELLING LANGUAGES

2.1 –The contribution of EMLs

Appearing at the beginning of the year 2000 under the umbrella of Instructional Design, pedagogical modelling languages were seen as being increasingly necessary to players in the field of open and distance learning. CEN ISS define an EML (Educational

Modelling Language) as a "model of information and semantic aggregation describing the content and the procedures in a UoL according to a pedagogic perspective with the goal of assuring reusability and interoperability." IMS LD version 1.0 (IMS LD 2003) fulfilled this definition. IMS LD, which originated from EML (Koper 2001)provides a methodological framework for modelling Units of Learning (UoLs) and aims to work as a compromise between a neutrality allowing the implementation of various pedagogic approaches and power of expression allowing for the precise design of a learning situation.

2.2 Defining a unit of learning with IMS LD

IMS Learning Design is based on the following principle: in a learning process each person has a role (learner or teacher) and seeks to obtain results by carrying out learning activities and/or support within an environment. The major concept of a Learning Design [2], the "Method " , is an element which allows the coordination of activities of each role in the associated environment to achieve learning objectives according to prerequisites. It is the element by which the learning process is defined and to which all other concepts are directly or indirectly referenced. The learning process is modelled on the metaphor of a play: from a structural point of view, a method is made up of one or more *plays*; a play is composed of a sequence of one or more acts: an act consists of one or more associations of a role with an activity or an activity structure (association of which is made through an element named *role-part)*

[3]. *Acts* follow one another sequentially although more complex sequences can be defined in an act. An LD is based on multiple-roles and multiple-users and in theory allows for a description of eLearning as well as traditional or blended modes of learning.

In order to enable the modelling of units of learning which increase in degrees of complexity , IMS LD offers three levels of design, namely A, B and C. At level B, IMS LD introduces *properties* which, in combination with the expression of conditions, enable the personalisation of the run. At level C, the designer can use *notifications*, in particular to define adaptable scenarios (Koper, R., Olivier, B., 2004).

As (Koper, R., Olivier, B., 2004) point out, this specification is too recent (February 2003) to accurately evaluate at present. It is necessary to await the development of authoring tools, content management systems and runtime environments so that the creation, sharing and the interpretation of LD runs become realities. If extensions or elaboration are offered in the future, only the establishment of true communities of practices with a strong degree of inter communication (European project UNFOLD), will enable the transition of IMS LD from being a "standard on paper" to a "standard of use ". However, it should be noted that there are a number of systems currently in existence or in development that are capable of interpreting LD. (Edubox, Reload, tools for modelling and runtime tools within the framework of the Alfanet project, Open Source environment CopperCore…).

2.3 –Taxonomy of scenarios and IMS LD

In a preceding article (Pernin&Lejeune 2004a), we proposed a model of eLearning based more on process and activities than on

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[2] Learning Design will be referred to as LD from hereon in

[3] For more information on IMS LD refer to http://www.imsglobal.org/learningdesign/ and for a French presentation refer to (Lejeune 2004)

content. This model is based on the central concept of the *learning scenario* which represents the description, carried out *a priori* or *a posteriori*, of the playing out of a learning situation or a unit of learning aimed at the acquisition of a precise body of knowledge through the specification of roles, and activities as well as knowledge handling resources tools, services and results associated with the implementation of the activities. This broad definition covers diverse circumstances: for example it could apply to a traditional or computerised learning situation or to a UoL lasting just a few seconds or a course spanning a number of years. In order to avoid any ambiguity, we have established a taxonomy taking account of the following criteria: aims, granularity, degree of constraint, degree of personalization, degree of formalization, degree of reification.

By comparing IMS LD to these criteria, we aim to remedy any possible deficiencies or inaccuracies.

Purpose of a learning scenario. A *prescriptive scenario* is established a priori by a designer with a view implementing the learning situation. A *descriptive scenario* describes the unfolding of a learning situation with particular reference to the activity traces of players and the work they produce.
* An LD describes a learning situation of which a device (partially or totally ICT based) will take control of the run. The information model of elements modelled relates to a prescriptive type of scenario. Some characteristics of a descriptive scenario are also envisaged: properties enable the storage of results obtained by a learner during an activity run and, in the same way, can be used to record the actual duration of a run of one step of the scenario, choice of route (path) or other traces. This last mechanism supposes that the LD incorporates level B or C in its design.

Granularity of an LD. Depending on the granularity of the learning situation at hand, we can distinguish between several levels of scenario. The *course activity scenario* describes an elementary activity (read a text, do an exercise, carry out a simulation), *an activity sequence scenario* describes the organisation of an activity sequence *and a pedagogical structure scenario* describes the structure of high level units such as lessons, modules etc.

* From a theoretical point of view, we can equally describe with IMS LD all of the above scenarios without a hypothesis explicitly founded on the level of granularity of a UoL. However, the smaller the level of granularity, the more the description demands pedagogical design skills on the part of the designer. And so, as (Santos, O., et al. 2004) points out, modelling a learning situation with IMS LD is not easy even if using predefined units of learning. More specifically, in order to describe an activity scenario in detail recourse to complex mechanisms such as properties, condition and notification is required.

Constraint of an LD A *constrained scenario* gives a precise description of activities to be carried out and leaves a small degree of initiative to the actors in the learning situation. *An open or adaptable scenario* gives a broad description of activities to be carried out and gives players choices which they are unable to anticipate without reducing the quality of the desired learning objectives.

Whilst IMS LD is particularly well suited to modelling constrained LDs, the specification suggests that control of a run can be entrusted to a learner, to a

member of staff or even to the computer. However, recent research (Santos O et al 2004) has focused on expanding the model to allow for the description of genuinely adaptable LDs.

Personalisation of an LD. A prescriptive scenario is *generic* if its run is identical from one session to another whilst an *adaptive scenario* takes into account personal profiles and allows for a conditional run and several personalised LDs which differ at the level of the given interactions or the resources that are made available.

IMS LD suggests that personalisation of UoLs is conducted according to the preferences, profiles, prerequisite knowledge of the users or a users educational needs/ situational circumstances (IMS LD Information Model). In order for LD to realise this objective, it has recourse to level B properties and conditions.

Formalisation of an LD An informal LD is designed by teachers according to empirical rules for the purposes of their teaching. A *formal scenario* uses a pedagogic modelling language in order to allow for sharing and reuse between communities of practice. An LD which can be interpreted automatically has to be formalised using a "calculable" pedagogical modelling language in order to provide partial or total automation. The principle of formalisation is intrinsic to pedagogic modelling languages. The vocabulary and the structure defined by IMS LD are supposed to be accessible to humans (as opposed to computers). In the scope of our work (project Emergence 2003 -2004) we have often been confronted with difficulties of terminology relating to the different subject-oriented cultures (cognition, teaching, computer science, pedagogues)

With regards implementation the information model provided in the form of XML schemas guarantees automatic and consistent interpretation by computer systems.

Reification of an LD An *abstract scenario* describes the constituent parts of the learning situation in abstract terms without accounting for the conditions required for implementation whilst a *contextualised scenario* gives a precise description of the actual constituent parts associated with the abstract scenario in terms of allocation of roles to real people, planning and the availability of knowledge objects, services and tools.

The conceptual model of IMS LD uses distinct elements to represent abstract constituent parts on the one hand (roles, description of services, knowledge objects) and on the other hand concrete resources (people, services, documents and IMS LD content). Nevertheless, difficulty lies in the fact that constituent parts and resources are defined at the same level without any effective distinction between stages leading to the contextualization of an abstract scenario. On the other hand, nothing stands in the way of pre-designed LD using specific physical resources from being modified to call up other knowledge resources, services or tools.

2.4 Extending work carried out to date
The analysis of IMS LD in the context of the taxonomy we have proposed highlights a number of inaccuracies. Whilst the conceptual model initially proposed by Rob Koper (EML)

constitutes an important step forward in terms of articulating the relations between actors, activities and resources, the proposed modelling language is not always clear in relation to the intended situations and the associated process of implementation. We should also point out that the IMS LD spec has become progressively richer in terms of items allowing for the effective description of a large variety of learning situations, but which are based on technical vocabulary (concepts, conditions, notifications, events) or which are broken down into discrete blocks (Levels A, B and C) which are not easily accessible to the public they were intended for. In effect, IMS LD appears to be more of an exhaustive information model than a methodological tool allowing for the progressive introduction of tools required by various users.

As a result, what follows is an attempt to elaborate on the work carried out in this sphere by defining a conceptual framework aiming to clarify the elaboration process, the evaluation of scenarios and the breakdown of a scenario into logical faces corresponding to representations used and understood by practitioners.

3. PROPOSITION OF A LIFECYCLE MODEL OF SCENARIOS

3.1 The four major stages of the lifecycle of an LD.

As a point of departure it is necessary to distinguish between a number of phases: inception, use and evaluation. We define the life cycle of scenarios as being composed of four main steps:

1. Initial conception
This phase allows for a general definition of the structure of an abstract scenario without accounting for the conditions needed for implementation

2. Contextualisation
This phase allows for the determination of conditions of use of an abstract scenario in a specific context in terms of authors, planning, resources, tools and services.

3. Use
This phase corresponds to the use of contextualised scenarios by different users (learners, teachers, tutors etc.)

4. Reuse
This phase focuses on the evaluation of results obtained during the previous phase with a view to setting conditions for subsequent reuse in other contexts.

3.2 Initial conception phase
This first phase enables a priori definition in general terms of the organisation and playing out of a learning situation. This task can be entrusted to a teacher in the context of perfecting his or her own pedagogical sequences, or it could be carried out by a specialist for industrial based training. This stage requires skills in pedagogical engineering as well as knowledge of the acquisition process for the intended target audience

The end result of this phase is an abstract scenario which does not account for the conditions of implementation. Moreover, the distribution of roles to real people, the association of resources described in an abstract way to concrete resources takes place during the contextualisation

phase. This type of scenario can be created from nothing or can be adapted from existing scenarios.

A prescriptive abstract scenario includes three complimentary sections:

- The prescription section specifies the organisation of activities which need to be carried out by the people involved in the learning situation as well as the definition of the environment associated with setting up activities (knowledge resources, tools and services). The nature of the prescription is linked to the didactic expertise of the designer and sets out to describe the conditions for the acquisition of knowledge at stake in learning;

- The Observation section provides the practical details relating to the capture and structuring of information such as intended learning activity or expected production. The structure allows monitoring of the activity tracks of a learner or a group of learners as well as the elaboration of more sophisticated descriptions such as profiles or learning episodes. Unstructured or structured tracks can serve as a basis for the control of a learning situation, or can also be developed with a view to future reuse.

- The control section defines a course of action to carry out subsequent to diagnosis conducted from observed or memorised information. The course of action can be in the form of direct feedback during

the learning situation (by sending a message, providing advice etc) or it could be an adaptation of the learning scenario, modifying the initial organisation of prescribed activities and the constituent parts of the environment.

3.3 The contextualisation phase

This phase enables a teacher to define the conditions for the set up of an abstract scenario in a concrete learning situation. We distinguish between a number of types of contextualisation tasks:

- Allocation of roles specifies the names of the people who will take on the roles defined within the abstract scenario; in this way we can associate the name of the teacher with the role of tutor and a list of learners to a work group;

- the planning of activities allows you to determine the conditions in which each of the activities is played out (duration, start date, finish date etc.);

- Mediatisation consists of the creation, reuse or adaptation of knowledge handling resources required for carrying out activities. These resources, digital or otherwise, could be ready made or created for the scenario in question

- Instrumentation involves the creation, reuse or adaptation of tools and services needed to carry out activities. Tools and

services can be pre-existent or not.

- Localisation involves making reused or adapted resources, tools and concrete services available to the actors for the duration of the scenario. In the context of digital learning spaces, this task involves the provision of a URL with access rights.

- The concrete expression of abstract constituent parts can lead to specifying certain elements in the initial abstract scenario. The final task involves the refinement of the scenario to ensure its coherence and completeness during use. In particular this task could lead to specifying the conditions of personalisation of learning in relation to the target audience of the learning scenario

A contextualised learning scenario can be considered as a concrete and refined form of an abstract scenario, ready to be implemented in a specific learning context.

3.4 The run phase

The run phase involves the implementation of a contextualised scenario in a learning situation. Its different facets (organisation of prescriptive activities, control and observation rules) serve as the basis for the actual activity of the different actors in the learning situation. As we suggested in our preliminary definitions, a scenario can be adaptable, that's to say it can be modified, personalised or dynamically completed by one or more

actors. An adapted scenario is the result of modifications made to the initial contextualised scenario during the playing out of the learning situation. These modifications can stem from:

1) the designer's will to delegate decisions, the anticipation of which would undermine the pedagogical effectiveness.
2) The character of the public concerned or the learning conditions
3) Weaknesses or inaccuracies in the initial scenario

As for the descriptive scenario, it retrospectively describes the playing out of the learning situation including the activity traces of the actors, their work or their interactions.

3.5 The reuse phase

The last phase in the life cycle of scenarios sets out to establish an assessment of activities carried out during the playing out of a a learning scenario. There is a double objective: on the one hand the evaluation of the effectiveness of a scenario in terms of didactics and pedagogy, on the other hand propensity for reuse in a different context.

We can distinguish between three main tasks within this phase : analysis, contextualisation and cataloguing.

The analysis of the learning situation is based on the comparison of the contextualised scenario, the progressively adapted scenario and finally the actual playing out of the scenario. This comparison can lead to

several types of conclusion depending on the case:

- The initial scenario has been the object of negligible adaptations and corresponds to the actual playing out of the learning situation.

- The initial scenario has been the object of important adaptations but corresponds to the actual playing out of the learning situation. In this case we should study the modifications made in order to determine the origins, which can be linked either to the poor quality of the initial scenario, or to the high specificity of the implementation. The response will lead to the decision to reuse the initial scenario or the modified scenario.

- The initial or modified scenario does not correspond to the actual playing out of the learning situation, this can reflect a lack of clarity, accuracy or appropriateness of the suggested scenario which does not correspond to the objectives, to the constraints or to the ability of the learners and the tutors. In this case, we need to question the relevance of the initial scenario or to detect errors made during the phases of contextualisation or modification.

Individual or collective motivation can preside over the decision to reuse an initial scenario or a modified scenario. In the first instance, a practitioner or a team of practitioners wish to improve the effectiveness of a training system using tried and tested means. The low variability of contexts can mean a high degree of reuse and progressive improvement of scenarios used. The second case corresponds to the will to share resulting in the emergence of a CoP: a group of practitioners united by a common culture of teaching, the level of the learner concerned, the pedagogical approach used etc. the desire of sharing know how acquired by some of its members. According to this hypothesis, the important variety of contexts could result in a halt if the shared scenarios are not sufficiently supple to be adapted to the demands of each.

In both cases, questions arise concerning formalisation and decontextualisation: how is it possible to describe a scenario in a way that is both complete and homogenous enough so that it can be easily reused? Does information that is too specific to the use context need to be disposed of in order to ensure wide-spread sharing of a tried and tested scenario? Once these choices are put into place, the decontextualised scenario should be correctly catalogued and indexed to make it easily searchable, reusable and adapted.

3.6 Summary of the life cycle of scenario model.

In the previous paragraphs we have described the design stages, contextualisation, use and reuse of learning scenarios. These phases successively change the structure of the learning scenario.

The abstract scenario, a result of the initial design phase, specifies the organisation in terms of three facets

(prescription, observation and regulation). And on the other hand it describes the environment required for a successful run (resources, tools, services, expected results).

The contextualised scenario, stemming from the contextualisation phase, refines the organisation of activities and specifies the material modalities (role allocation to people, planning) and associates concrete and findable objects with abstractly defined entities (resources, tools, services results) in the abstract scenario.

The adapted scenario is the result of gradual modifications of the contextualised scenario dynamically carried out by different types of actor (tutor/facilitator as well as learners) during the actual playing out of the learning situation.

The descriptive scenario or actual run, describes the playing out of the learning situation in the same terms as ready made scenarios: sequence of activities actually carried out, resources, tools and actual services used. Add to this information the work carried out by actors as well as the tracks of their activities.

The standard scenario, one of the possible results of the reuse stage, is obtained from the analysis of the actual run and from the comparison with other pre-made or adapted scenarios. Decontextulaisation enables the abstraction of information that is too specific and which could constitute an obstacle to their reuse in other contexts.

4. Technological Instrumentation of the suggested life cycle model

In the last section we proposed a lifecycle of scenario model. The computerisation of this model consists of introducing automatic mechanisms or help modules for certain stages of the process. This entails developing new functions which can be integrated into existing families of environments (within digital training spaces for examples) or proposed by new types of software.

In order to categorise these functions, it is necessary to take into account the degree of integration of digital technologies in the practice of the actors concerned and to allow for uses which are compatible with the material constraints on an institutional or cultural basis. For example, some teacher practices catalogued on the Educnet site show a willingness to share learning scenarios which don't require the use of a computer even though this constitutes an important element in terms of exchange and communication between practitioners. The reasons for this limitation stem from economic reasons (the teachers are more likely to have access to computer equipment than the students are), but it could also be linked to the conviction, justified or otherwise, that digital technologies do not noticeably improve the effectiveness of learning in the target subject area. We must therefore study the difference between functions relating to the management of scenarios and those relating to automatisation of learning situations by computer technologies.

4.1Managing learning scenarios

The objective here is to allow exchanges between practitioners by rationalising

the design and the reuse of learning scenarios which have been formalised according to a common set of rules. Consequently this entails the provision of computer tools with the following functions:

Assistance function for the design of abstract scenarios:

- Create an abstract scenario: definition of the environment, organisation of activities based on the three facets of: prescription, observation and regulation:
- Editing and modifying an abstract scenario.

It should be noted that if each of the three sections of prescription, observation and regulation can be predefined in the initial scenario, it could equally be delegated to one of the actors (tutor or learner) during the run phase. In the case of non-computerised training, it is rare to find explicit formalisation of observation and regulation, the know how of teachers being considered sufficient unto the task

Assistance function for the contextualisation of scenarios

The objective here is to be able to define an operational scenario in the context of a given learning situation from an abstract scenario. The principle functions are:

- Refining the scenario to ensure its coherence and completeness during the run phase
- Refining role types in the abstract scenario for real people

- Planning of activities according to a specific timetable (length, start date and end date)
- Associating concrete objects to abstract resources for knowledge use, tools and services.
- Locating concrete resources in the environment or spaces designed to capture work carried out or activities completed;
- Decontextualise scenarios in order to render them suitable for cataloguing purposes.

In a computerised learning context, abstract resources should be associated with concrete digital resources. The catalogue of scenarios will then have to be made interoperable with the catalogue of resources through the agency of a repository.

Cataloguing and search functions for standard scenarios
This is a case of managing catalogues of standard scenarios described with the help of the same rules and the following functions:

- Indexing an abstract scenario with a view to its cataloguing

- Cataloguing a scenario among standard scenarios
- Looking for a scenario in a catalogue of standard scenarios

- Importing a standard scenario from a catalogue to an editing tool intended for abstract scenarios.

Cataloguing presupposes the existence of a description language which is standardised to allow for the widest

degree of exchange possible between practitioners.

4.2 Total or partial automatisation of computerised learning situations.

In the context of computerised situations, some functions traditionally confined to humans (prescription, observation and regulation) can be automatically run or assisted by dedicated computer environments.

Automatic run function of different scenario facets

In this case all the rules defined by the scenario must provide actors with the following:

- Automatically prescribe activities
- Provision of appropriate environment to the actors concerned
- Automatically ensure the observation and the regulation of activities according to the rules established in the scenario

This automatisation supposes that the work environment of the user is equipped with a runtime engine which is is capable of interpreting a standardised description of a scenario whilst integrating other pre-exisitng identification functions, planning functions, availability of resources, tools and services. It's this type of automatisation which we are working towards in the Emergence project by integrating a runtime engine within the Digital Training Environment

Assistance and observation functions and the control of scenarios

We have seen that in computerised cases, it is possible to envisage the dynamic adaptation of scenarios during the implementation phase. This approach can be linked to two types of context, in the first case it entails a reflective approach on the part of the learner and in the second, to allow the teacher to be able to better determine the follow up conditions and control of the learning situation. In particular, it should be possible for the learner or the tutor to:

- Set the collection and structure rules of raw observed data (activity traces, work done etc)

- Set the rules for capitalising on raw or structured data

- Selection means of visualising the observed data

- Establish diagnostic rules

- Dynamicaly regulate the situation in a general or personalised way

- Dynamically adapt the initial scenario in order to make it correspond to observed data and to the diagnostic used

Conclusion

The article features a definition of a learning scenario management process as well as a structural model describing the different facets of a scenario.

These suggestions need to be used by teachers in order to give rise to new artefacts within the confines of a

conceptual approach. There's no guarantee that the suggested solutions put forward for complete automatisation will fulfil all expectations.

By putting rigorous observation practices in place, by studying the appropriateness of new tools with their institutional constraints, technology, culture etc. we can expect to find in the near future a truly effective integration of digital technologies in the practice of teachers and trainers.

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