Semantic Web and E-learning

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WP 25.5 Deliverable

Common proposal for a future kaleidoscope JREIP on "Semantic Web and E-learning"

Abstract

This deliverable aims to build a common proposal for a future kaleidoscope Jeirp on “Semantic Web and E-learning” of 18 months (perhaps a creation of an ERT) in the continuation of this present Jeirp which was an assessment Jeirp. First, for each of the first four workpackages 25-1,2,3,4, we present the major results, a brief synthesis and some challenges or open problems. Then we describe some results of integration like organisation of meetings or workshops. Finally we describe the proposal of a new Jeirp titled “Semi Automatic Techniques for Ontology Evolution in Educational Systems”. This proposal has been submitted in June 2004 to the kaleidoscope call.

1 Introduction

This deliverable considers the requirements and use cases (WP4) defined in the workpackage 25-4 on current and future uses of semantic annotation of learning content and ontologies. It exploits the investigations results carried out in the packages 25-1, 25-2 and 25-3, in particular on part "common proposal for future work" of each of these WPs, i.e. study of methods, standards (WP1) and tools (WP2) of semantic annotation of learning content and ontologies; and proposal of organisation and storage of the metadata, annotations and ontologies (WP3).

Two key points characterise the semantic web: Metadata and annotations, and ontologies. Semantic annotations suppose the use of a formal representation like ontologies. In the present Jeirp, we focused on metadata and annotations. We did not have time to study the aspect related to the ontologies.

The new proposal focuses on ontolgies and specifically on the problem of ontology evolution. Indeed, giving use of educational materials, integration of new materials, annotation process, and others events, it is essential to make ontologies evolve and to control this evolution. The objective is to define semi-automatic techniques for ontology evolution in educational systems by identify the several cases which can involve an ontology evolution, define what events fit the evolution process, and describe processes for the ontology evolution.

The contribution is at the same time theoretical, methodological and applied. It consists to identify events and scenarios, define concepts for identify, notify and revise the concepts of ontologies, suggest semi-automatic tools to help to manage the ontologies evolution. Some events will be studied like: new educational material, user behaviours, frequent student errors and feedbacks of assessments, annotations, or course composition. Each partner will be to propose a case of ontology evolution related to his current work.

The methodology proposed is composed of three steps: i. Define the several cases of ontologies evolution in the specific domain of e-learning. ii. Describe processes associated to these cases illustrated by examples. iii. Describe functionalities and specifications for semi-automatic techniques.

The reading order suggested of the five deliverables of the present Jeirp is as follows:

- D25-4-1: Current and future usages of annotations, metadata and ontologies
- D25-1-1: Methods and Standards for Semantic annotation of learning content and ontologies
- D25-2-1: Tools for semantic annotation of learning content
- D25-3-1: Metadata analysis and management services
- D25-5-1: Common proposal for a future kaleidoscope Jeirp on “Semantic Web and E-Learning”

2 Synthesis and Major Results of the assessment Jeirp "Semantic Web and E-Learning"

2.1 Current and future usages of annotations, metadata and ontologies (WP 25-4)

Majors Results

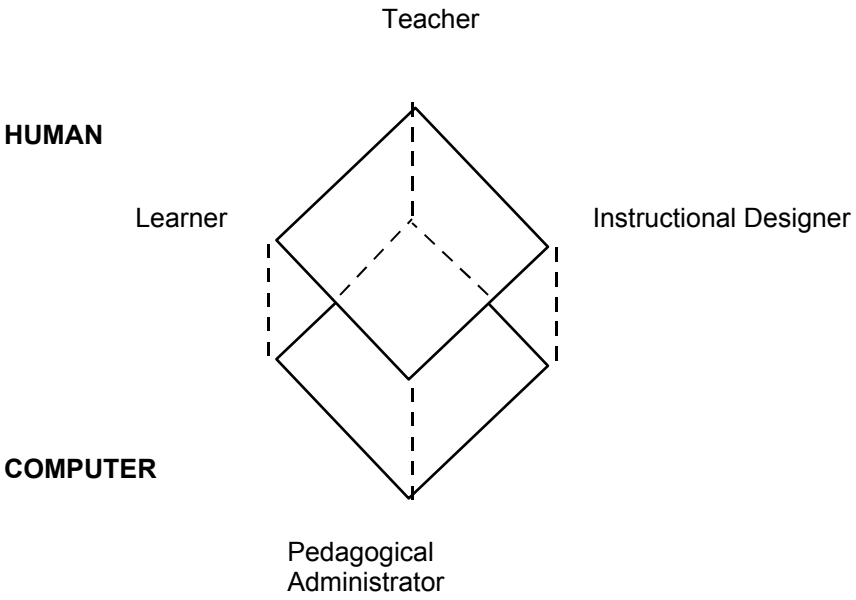
- Providing a methodology based on user roles to identify and describe current and future usages or scenarios of semantic annotation of learning content.
- Identifying scenarios and roles.
- Providing an overview on current and future usages of annotations, metadata and ontologies in the e-learning projects of the JEIRP partners.
- Identifying open research questions.

Synthesis (cf. details in deliverable 25.4.1)

The purpose of the WP 25.4 was to provide an overview on current and future usages of annotations, metadata and ontologies in the e-learning projects of the JEIRP partners. This WP defined a methodology based on the concept of user role which allows for a structured presentation of these usages and also identifying open research questions.

Most roles can be played by humans as well as software agents implied in learning or teaching actions. Each of these roles potentially interact with the learning resources and since works with metadata or annotations, adding metadata to a learning resource, using previously added metadata, with a manual, semi-automated or automated method.

We defined four roles: Learner, Teacher, Instructional Designer, which is creating learning resources, and Pedagogical Administrator, which is concerning with the effectiveness of learning and the quality assessment.



We identified five current scenarios at three levels:

- Pedagogical scenarios:
  - Course generation, Exercises assessment.

- Technological scenarios:
  - Quality assessment through data analysis.
- Memorization and search scenarios:
  - Suggestion of learning material,
  - External memorization: It is the activity where the user of an electronic document memorizes notes of events and knowledge while reading the document.

Future scenarios are usages which are not yet scientifically investigated. They are the same those current usages but with some specifics aspects:

- The course generation scenario takes in count Course composition using several educational materials available on the web.
- Quality assessment through data analysis and application in the European higher education system (Licence-Master-Doctorat).
- Future usages are often situated in a distributed context (P2P) which constitutes a technological scenario.

Each scenario describes creation and use of metadata, annotations or ontologies.

We used scenario tables for describing these several scenarios and we explored the various use and creation scenarios.

We focused on the contexts the JEIRP partners are involved in. For each of these contexts, the methodology was the following:

- Defining the cells of the table corresponding to a current use of metadata.
- For each selected cell, specifying two scenarios: the metadata creation scenario and the metadata use scenario.

For each scenario S and for each role R, we defined metadata/annotation previously created by another role, human or artificial.

In order to explore the various use scenarios in a given context, we set up for each context a table expressing which role uses a metadata/annotation (columns) previously created by another role (rows). Using this methodology, we identified 17 current usages and 24 future usages.

Challenges: Open problems

The use of the methodology allowed characterizing possible future usages which could be identified. These two areas of research can serve as a basis for future collaboration among the Kaleidoscope partners.

A first area of research is to extend the scope of existing roles. For instance, learners can take a more active part (cf. PISA studies), as annotators of learning content (future usages of course generation) or by rating courses (European Higher Educational System scenario).

A second area focuses on the evolution of e-learning standards, like IMS and SCORM specifications, requiring some higher level specifications. To what extent the use of ontologies can support the effective usage should be investigated in a following Jeirp.

2.2 Methods and Standards for Semantic Annotation of Learning Content and Ontologies (WP 25-1)

Majors Results

- Overview on the current methods and standards for semantic annotation used in e-learning projects of the Jeirp partners.
- Comparison with other relevant projects: Overview of the Edutella System, e-learning project in a distributed environment, based on Peer-to-Peer networks.

- Brief survey of common semantic web standards adopted to represent learning material
- Overview of the partners and their view points on Semantic Web applied to E-Learning in regard to the:
  - definition of metadata ontology and annotation,
  - description of the adopted standards ant the proposed methodologies used in their projects,
  - needs and possible suggestions about annotations tools.

Synthesis (cf. details in deliverable 25.1.1)

The overview on the current methods and standards for semantic annotation used in e-learning projects of the Jeirp partners, highlighted an absence of methodology, rarely, ontology and instructional design defined by Mizogucchi are used.

Common definitions

- A metadata is a data about a data.
- An ontology is an explicit formal specification of the terms in a given domain and the relations among them.
- An annotation means both the act of adding notes to a document and the notes itself. Dislike metadata, annotations are added information of a located part of the document and are rather subjective.

Standards used

The most used standards and tools among the partners are:

- LOM for representing Learning Objects, SCORM for packaging, RDF as a framework to represent metadata and ontology, OWL for ontology descriptions, Dublin Core sometimes used for administrative information, LIP for representing users.
- Protégé to help to build ontologies and semantic annotation and check consistencies. Sometimes concepts maps.

Others standards are used in specific domains:

- OpenMath,
- OMDoc to represent learning material at paragraph level,
- adaptation of tools like CoolModes.

More rarely: Specific learning software (Logic Tutor) and Standards (RELOAD tools, Cancore)

Methodologies and scenarios

Each partner is involved in different projects, each one with its own objectives and application domains, sometimes very different the one from the others. For example, some projects are focused on specific mathematical domains, others are domain-independent. So the adopted methodologies are not unique. The proposed synthesis of the most common partners' viewpoints cannot be a unique and consistent approach.

Needs

- Automatic annotation tools to simplify the work of annotators
- Automatic metadata extraction tools
- Input of mathematical formulas
- Dealing with the problem of "overloading" of symbols, names, multiple views of learning objects
- Standard way of adding pitfalls to avoid in the exercises
- Possibility to have more pedagogical notes to the documents than asked for a LOM description

Scenarios

Several scenarios studied by partners require the use of technologies of the semantic Web and of ontologies:

- Store mistakes made by students while solving exercises

- Annotations by teacher to the exercises stored (first steps of the proof)
- Store learning objects in a digital library system
- Represent mathematical documents with formulas that carry semantics
- Students making notes read by teachers (or fellow)
- Teacher creating content used by teachers/students
- To help learners and teachers find and share useful learning objects on the Web
- To provide personalised access to these learning objects
- Adult learners interested in learning about specific objects
- Information represented about the learning objects and about the learners and teachers including competencies and learning objectives
- To help a teacher to compose his course with a P2P architecture integrating web services To assist a teacher to revise his course after the students learning phase by analysing their browsing
- To perform European higher educational system
- To search learning objects in a P2P network

Challenges: Open problems

The design and the development of semi-automatic annotation tools are essential.

The description of the learning material by means of metadata/ontologies cannot be static but should be able to evolve. Data descriptions (metadata and ontologies) can change during the time. Different representations of these data descriptions, as well as different instances or versions of the same description could be stored in different peers, while a mapping mechanism would provide for the possibility to communicate among peers. We could adopt an approach such as that of Edutella for the data but for the metadata and the ontologies.

2.3 Tools for Semantic Annotation of Learning Content (WP 25-2)

Majors Results

- Providing the specification for semantic annotation tools for e-learning.
- Proposal of Requirements categorizing and evaluation of existing annotation tools.
- The tools respecting the most of the requirements are computational, cognitive and semantic.
- Illustration on two research prototypes of annotation tools developed by partners.

Synthesis (cf. details in deliverable 25.2.1)

Currently few tools exist dedicated to the tasks of annotating learning material.

We defined specific requirements of annotating learning material from the scenarios collected from partners in WP25.4 and from a review of existing annotation tools characterized by properties specific to the elearning.

Three specific requirements for e-learning annotations tools

- Usefulness: takes into account teaching/learning context: topics to be taught, objectives and the addressee of the annotation, activities (exercise, lab work, lesson, etc.).
- Shareability: enables teaching/learning actors (human or software agents) to communicate through annotation:
    - with an explicit semantic related to the teaching/learning context
    - by complying with e-learning standards (LOM, …)
    - by the means of a visual form
    - by enabling the user to share annotation with others in the same elearning context (class or group)
- Usability: Annotation does not disturb teaching/learning activities.

Three characteristic properties of existing annotation tools

- The author/annotator: automatic, manual or semi-automatic annotation,

- The addressee / user of the annotation:
    - cognitive versus non cognitive annotation: annotation can be handled by human
    - computational or human
- The fact that the annotation is semantic (realized with a formal representation like an ontology) or not.

We analyzed 28 existing annotation tools from these criteria and obtained the following interesting results:

- All the non semantic cognitive tools realize the requirement “does not disturb the activity” but it is not the case for semantic tools.
- Some non cognitive computational semantic tools already use the e-learning standards (mainly LOM).
- Very few other e-learning requirements are currently respected but some could be reached with an adaptation of semantic tools: usefulness, shareability and usability concerning teaching context.
- The “shareability with an explicit semantic” and “does not disturb the activity” requirements are yet respected by some tools that provide annotation with ontologies of teaching topics.

Our conclusion is that semantic annotation tools for learning material should keep the way the non semantic tools respect the requirement “does not disturb the activity” for manual and semi-automatic tools and should be enhanced without too many difficulties to take into account teaching/learning context (not only topics to be taught, but also teaching/learning activities). A major point for research on this type of tools would be to provide teachers and learners graphical means that correspond to their use (requirement “shareability by the way of a visual form”, not possible for any tool yet).

Challenges: Open problems

In general, research should be focused on how to mix the semantic aspect with the cognitive one, without losing the quality of either of them. Concretely, how to support human to annotate pedagogical material simply and with a rich semantics is still a research question.

Teachers, learners, instruction designers and other actors may have their own needs when they annotate learning material. We should study specific requirements from different parties.

Few tools provide the possibility to combine domain ontologies with teaching/learning ontologies.

Like in the WP25.4, it would be interesting to separate roles (possibly performed by a human) and who performed it (human, machine or both).

From our categorization, the tools respecting the most of the requirements are computational, cognitive and semantic. The promising direction could be to design annotation tools where the user can let the software compute inferences for him. Some example of tools functionalities: make the annotation automatically, remind automatically in specific context, annotations already realized by the annotator, semantic use of e-learning standards like LOM in order to be able to annotate teaching/learning activities and support the share and reuse of the annotations.

2.4 Metadata Analysis and Management Services (WP 25-3)

Majors Results

- Requirements of elearning systems in terms of the analysis and management of their metadata.
- Proposing a set of common data analysis and management services needed by e-learning applications with respect to their metadata requirements, both currently and in the future.

Synthesis (cf. details in deliverable 25.3.1)

To avoid to develop systems form scratch, we identified a set of 13 common data (analysis and management) services that are either used in the current scenarios, or needed in future scenarios: centralized data, distributed data, simple search, sophisticated queries, integration or mediation, authorization, data warehousing, data mining, notification, transaction services, replication, views, versioning.

Then we analyzed the data services required, currently and in the future, by each of the 5 scenarios previously identified: Course generation, Exercises assessment, Suggesting learning materials, Quality assurance using data analysis, external memorization.

The most of the scenarios currently use centralized data with simple and sophisticated querying of that data. Distributed data and authorization mechanism are required in two scenarios, but all other services are used in at most one scenario.

For the scenarios in the future, at east 4 of the 5 scenarios will require access to distributed data, authorization integration or mediation, notification and transaction services, replication, data mining, and views. The only services that will not be required by at least 4 of the 5 scenarios are data warehousing and versioning.

Then we described a brief survey of some existing systems for storing metadata that provide most of the data services. General metadata repositories that might provide such functionalities are still evolving; netherless we provided a brief survey of some ontology and some RDF storage systems.

Challenges: Open problems

Future e-learning applications are going to require more sophisticated management and processing of their metadata. In addition, the ability to process metadata in a declarative manner at a high level of abstraction will significantly reduce the development and maintenance costs of these e-learning applications. Since not all functionality will be needed for all e-learning applications, modular metadata repositories will allow applications to install only those services that they require.

3 Integration Results

3.1 Meetings and Workshops

During the duration of the assessment Jeirp, 9 months from January to September 2004, we organized two meetings and two workshops.

A first meeting was held in Grenoble, during the Kal kick-off on 11 March 2004, where 8 partners participated [Report-Weblearn-Meeting1-March2004]. We programmed the content of the 4 WPs 25-1,2,3,4, we distributed tasks between the several teams, we defined the programme of the first Workshop, and established relationships with SIGs, mainly with AI&Ed and GRID.

The first two-days workshop was held in Paris on 3-4 May 2004 [Report-Weblearn-WS1-May2004]. There were 19 participants from 9 partners by 10. We worked on WPs 25-1.2.3.4, and for each of them, we defined form and content of the deliverables. In particular, it was recommended to submit papers at conferences and workshops. We defined some references specific to our area, we affected a partner in charge of connexion with others kaleidoscope JPAs. Then we discussed about the WP25-5, a new proposal of Jeirp, since our Jeirp was an assessment and the objective of this WP was to propose a new Jeirp. Before this workshop, about ten work papers were sent to respective WP leaders. These papers are on the “sympa” mailing list kal-weblearn@lirmm.fr. Several slides and documents are available. Cf. annex C: Programme and participants at this workshop.

The second weblearn meeting was held in Duisburg May 20-21, 2004. Five partners of the Jeirp Weblearn participated to the worshop "New Directions for AI&Ed”. With two new partners, M. Felicia Verdejo form Madrid and Nils Malzahn from Düsseldorf, we proposed a new Jeirp titled “Semiautomatic techniques for ontology evolution in educational systems”. This proposal was submitted to kaleidoscope, end of June it was not accepted.

The second two-days workshop was held in Porto on 29-30 August 2004 (cf. programme and participants in annex D). There were 9 participants from 8 partners by 10. During this second WS, we defined:

- The content of each WP 25-1,2,3,4, and for each of them, we specify some prospective. We worked also on the harmonisation between the scenarios of the several WPs.
- The specificity of our approach compared to existing studies like Edutella or other works.
- The connection with the needs of ontology evolution.

- The Semantic Web and Elearning JPA and the others Kaleidoscope JPAs: ATA, Doctoral School, Platform, AI&Ed, Learning Grid, etc.

3.2 Joint papers accepted in conferences in 2004

Two papers are co-authored by WebLearn partners and accepted: one paper in the Workshop SW-EL2004 in conjunction with AH'2004, International Conference on Adaptive Hypermedia, relevant of WP25.2 (annotations) [Azouaou et al. 2004], and one poster in ISWC'2004, International Semantic Web Conference, relevant of WP25.4 (futures usages) [Ullrich et al. 2004]. cf. Annex A.1.

In addition, in 2004, 25 accepted papers, relevant of Semantic Web applied to Education, are been authored by partners implied in the Jeirp Weblearn. cf. Annex A.2.

3.3 Common organization of two Workshops in 2005

We organise a workshop titled "Semantic Web for Web-based Learning. Implications in the area of Information Systems in Education" in conjunction with CAiSE 2005, the 17th Conference on Advanced Information Systems Engineering, which will be held in Porto, 13-17 June 2005.

A workshop titled "Ontologies and Semantic Web Technologies. Applications in Education" is submitted in conjunction with AIED'2005, The International Conference on Artificial Intelligence and Education.

We can note the interest of application of semantic web technologies in the field of education through the organization of workshops. For example, we can note the 2nd International Workshop on Applications of Semantic Web Technologies for E-Learning (SW-EL'04) which is organized in three sessions, one at ITS (Intelligent Tutoring Systems), one at AH (Adaptive Hypermedia) and one at ISWC (International Semantic Web Conference). Some papers were sent by weblearn partners and some partners will take part in these various conferences

4 Proposal of a new Jeirp: "Semi Automatic Techniques for Ontology Evolution in Educational Systems"

4.1 Partners

University of Montpellier II (Danièle Hérin), Consorzio CRMPA (Enver Sangineto),
University of Bergen (Weiqin Chen), University of Duisburg (Niels Pickqart),
UNED (Maria Felicia Verdejo), Ecole Léonard de Vinci (Michel Scholl),
University of Porto (Carlos C. Oliveira), GET-ENST (Serge Garlatti), AIDA (Monique Grandbastien),
University of London (Peter Wood), MeTAH-CNRS (Cyrille Desmoulins).

4.2 Summary

Objectives

It is known that the semantic Web is an innovating technology promising for exploring the future of learning, and that there are two key points of this technology, on the one hand the metadata and the annotations, on the other hand ontologies. In the context of Kaleidosope NoE, a first assessment Jeirp "Semantic Web and Eleaning" studied more particularly the aspects related on the metadata and the annotations on materials of the elearning. The objective of this Jeirp proposal is to study the aspects related to ontologies focusing on the problem of ontologies evolution which is very little studied in the field of learning, though it is very useful.

Indeed, many material owners have already described their learning materials, respecting the standards and norms more or less, using semantic languages of the Web such as XML, RDF, OWL. These users had to develop ontologies in order to index and annotate these materials. Indeed, ontologies are a pivot for the indexing, the annotation and the research of learning materials. However because of the use of these materials, the integration of new materials and the annotations process by teachers or students, it is essential to make ontologies evolve and to control this evolution. This phase

of ontologies evolution is a key point in the engineering of ontologies for the elearning and consequently of the engineering of learning materials.

The objective of this Jeirp proposal is to define semi-automatic techniques for ontology evolution in educational systems by:

- identifying the several cases which can involve an evolution of an ontology,
- defining what events fit the evolution process,
- describing processes for the ontology evolution.

Evidence of the original character of the proposal

A lot of studies have been realized in the field of ontologies and their revision, independently on the domain of study. In the same way, in the elearning field, the design of ontologies and the various types of ontologies specific to teaching were largely studied (cf Mizoguchi). Very few works are related to the evolution of ontologies in the context of elearning. topic which according to us, is an integral part of the ontologies engineering. In particular the events which start the evolution of ontologies, the strategies of evolution, the processes of evolution and the incidences of this evolution specific to the field of education were not studied.

Theoretical, methodological or application contribution

Our contribution will relate to theoretical and methodological aspects:

- Identification of events which imply the evolution of ontologies and scenarios associated.
- Definition of concepts necessary to the identification, the notification and the semi-automatic revision of concepts of ontologies.
- Suggestion of semi-automatic tools to help to manage the ontologies evolution.

Different methods to evolve and redesign ontologies can be listed like: new educational material, user behaviors, frequent student errors and feedbacks of assessments, annotations of learning material by some community of students or teachers.

Each partner will be to propose a case of ontology evolution related to his current work.

4.3 Added value to the assessment Jeirp

In a distributed environment where teachers put their learning materials on their web site or on some platforms and since keep their materials under control, teachers can develop their materials with different ontologies. More, materials are often described and developed from several ontologies. Like we indicated above, a lot of studies have been realized in the field of ontologies and of their revision, independently on the domain of the study but not in the elearning area. In addition, in this area, design of ontologies was largely studied but very few works are related to the evolution of ontologies.

4.4 Contribution to (in terms of deliverables)

Contribution to the Kaleidoscope integrating process

This action is a complement and a continuation of the Jeirp “Semantic Web and Elearning” with a focus on “ontology evolution”. The first Jeirp assessment “Semantic Web and Elearning” was focused on metadata and annotations. During these first nine months, partners worked together and started a work of integration by the organization of two workshops and the submission of common papers. In this Jeirp proposal, a majority of partners was involved in the assessment Jeirp “Semantic Web and Elearning”. The integration of new partners specialized on ontologies, brings at the same time an added value and shows our objective of integration.

We could use the scenarios of ontologies usages defined in the workpackage 25-4 of the Jeirp assessment « Semantic Web and Elearning ». This will provide an overview on current and a perspective on future usages of metadata and ontologies in e-learning projects of the Jeirp partners. A methodology based on user roles is used for the description of several usage scenarios.

In complement to the workshops for the members, the organization of an open workshop with call for paper will support the integration on the kaleidoscope level and the dissemination.

Contribution to Backbone ATA, VDS, SVL

Dissemination of the results will be carried out through an open workshop and deliverables will be constituted of papers submitted to some conferences or journals.

Contribution to Virtual Doctoral School will be double:

- Supplier of a course. From the work completed in the Jeirp "Semantic Web and Elearning" on metadata and annotations, and the work realized in this Jeirp, around the evolution of ontologies, we could be able to build a course on the use of the Semantic Web technologies in the elearning on the levels of metadata, annotations and ontologies.
- Proposal of a methodology, scenarios and semi-automatic tools for the management of learning materials. When the VDS receive learning materials, courses could be carried out with an author specific ontology. Deliverables of this Jeirp could be used in order to connect and to integrate various ontologies and to make ontology evolve when new resources arrive or when authors, teachers or students are using materials.

Possible links to other KJAs (complementarity, follow up, etc.)

This Jeirp will be in direct connection with the SIG AI&Ed since it use Artificial Intelligence approaches, and with the SIG GRID since we consider that we are in a distributed environment in which each peer proposes learning materials and uses learning materials of other peers, either to build its own courses, or to use them directly in his classes.

- SIG AI&Ed: Models and tools described in the deliverables, in particular artificial intelligence approaches, will be transmitted to the SIG AI&Ed in complement with the other actions of the SIG.
- SIG Grid: As the work of the jeirp is being realized in a distributed context, the results of the jeirp will be able to bring the semantic aspects which are currently interesting the SIG Grid and would come in complement of others actions of SIG GRID.

4.5 Organization of the activity

Each partner will propose a case of ontology evolution. Some cases have been already listed: incidence of annotations, metadata analysis and mining techniques, new materials, typical errors of students, etc.

Methodology

1. Define the several cases of ontologies evolution in the specific domain of elearning.
2. Describe processes associated to these cases illustrated by examples.
3. Describe functionalities and specifications for semi-automatic techniques

Workpackages

The activity will be organized in five Work Packages. A deliverable will be associated to each WP.

- WP1. Literature review on ontology evolution in the context of elearning. Listing of associated events and scenarios of ontology evolution.
- WP 2. Study of the several scenarios and their impacts in particular on annotations and metadata.
- WP3. Categorization of the observed ontologies evolutions.
- WP4. Investigation of semi-automatic tools for each scenario and category.
- WP 5. Connection and Integration of Ontologies for appropriated scenarios.

In many e-learning scenarios, it is impossible to construct and maintain a single ontology. In contrast e-learning units evolve independently of each other, cannot agree on the same metadata vocabulary and hierarchies, but need to cooperate and to design a mapping between heterogeneous descriptions of pedagogical resources. Basically this mapping implies connecting nodes (terms) of different ontologies. Here evolution of ontologies means sharing and connecting different ontologies for an e-learning objective: for example creating a course using pedagogical units described in another ontology. Several scenarios have of course to be studied in order to specify ontology integration methodologies, relying on the state of the art in other domains: cultural inheritance as for example, in which field a mature technology of thesauri production, exchange and integration exists.

The WP5 will among other tasks i. identify several scenarios where the "sharing" of different sets of metadata (and more specifically ontologies) are indeed temporarily necessary; ii. For each of them study the adequation of models proposed in the literature and eventually suggest the investigation of new models to satisfy the specific needs of some e-learning scenarios.

4.6 Tasks

Objectives

- Constitute a literature review on ontology evolution in the context of elearning and describe the ontologies life cycle in the elearning context.
- Identify the several events which start a process of ontology evolution: when the ontology has to be modified?
- For each event to identify scenarios and describe the process by a model.
- For each scenario to identify impacts of evolution in particular on annotations and metadata.
- Investigate semi-automatic tools to help to manage the evolution of ontologies with the objective to detect concepts and / or constraints susceptible to evolve, notify them to the ontologies managers or teachers, identify and notify impacts of this evolution on annotations and indexation of materials, eventually to update a part of the ontology, to detect inconsistencies due to inferences generated from the original ontologies.

Deliverables

- D1 (month 3) Literature reviews on ontology evolution in the context of elearning and list of events and scenarios.
- D2 (month 4) Description of several scenarios of ontologies evolution.
- D3 (month 7) Categories of ontologies evolutions.
- D4 (month 12) Suggestion of semi-automatic technologies for each scenario / category of ontology evolution.
- D5 (month 12) Suggestion of semi-automatic technologies (new or current) for each scenario of ontology evolution implying to combine or integrate several ontologies.

Milestones

- M1. Literature review and listing of events and scenarios
- M2. A first workshop will be held with the Jeirp members in February 2005 to collect the different scenarios. First discussion on categorization of different scenarios and repartition of categories between partners.
- M3. Each partner works on the several scenarios of his category.
- M4. The second workshop will be held with the Jeirp members in June 2005 to investigate semi-automatic ontologies evolution tools.
- M5. Proposals and application to the selected case-studies.
- M6. Organization of an open workshop on “Semantic Web and Ontologies Evolution for learning” with call for papers, will be organized in connection with an international conference.

4.7 Potential impact

Theoretical / methodological impact

The knowledge of events and scenarios which start an evolution of ontologies, the models which will be proposed will indirectly help the users (teachers and administrators of learning materials) to control the contents of the courses managed in a context of using technologies of the semantic Web. Indeed, the inevitable evolution of ontologies disturbs the indexation, the annotations, the metadata and the search for learning materials. It is a key problem in the technology of the semantic Web. This Jeirp has no ambition to resolve this problem but will try to help to face the evolutions and their impacts.

Software

Scenarios and suggestion of semi-automatic tools can be used to develop future tools.

Experience

The several partners will have a good shared experience of the different scenarios and impacts of ontologies evolutions. This experiment will allow measuring the incidences of uses of ontologies on the management of learning materials.

4.8 Evidence of potential for future funding

Needs for Ontolgy Evolution are crucial in Organizations, to face with the growth of educational resources available on the web or platforms. Future funding can be obtained from industry partnerships or a Strep. It is expected that national research organizations from partners countries will support such as research.

5 Realization of KAL aims

Legend: the degree of realization is noted by stars: *: weak realization. ***: strong realization

*** Bridge the current gap between digital technologies and the learning area

** Integrate existing European initiatives and fostering new research teams (new common proposal + perhaps ERT in 2006)

** Develop new tools and methodologies that operationalize an interdisciplinary approach (new methodologies)

* Strongly focus on integration of different research disciplines relevant to technology enhanced learning, bridging educational, cognitive and social sciences, and emerging technologies (essentially technologies)

* Availability of finalized and on going research results on the Virtual Laboratory

* Incorporate young researchers through the virtual European doctoral school

* Plan for promoting gender equality in the network: 1/3 females

*** Generic approach (not focus on a special learning domain)

** Strong long-term research (both educational approaches and semantic web technologies)

* structuring potential?

Annexes

Annex A: Bibliography 2004 authored by partners and jointly by Weblearn partners

Annex B: Dissemination of WebLearn
Annex C: Workshop 1 in Paris - 3-4 March 2005
Annex D: Workshop 2 in Porto - 30-31 August 2005

Annex A: Bibliography 2004 authored by partners

A.1 Bibliography 2004 authored jointly by Weblearn partners

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A.2 Bibliography 2004 authored by partners implied in the Jeirp Weblearn and relevant it

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Annex B: Dissemination of Weblearn

We decided a correspondent of WebLearn JPA in charge of connexion with others Kaleidoscope JPAs for dissemination and information on results and manifestations. The Weblearn partners in charge of these connexions are the following:

- SIG ATA: Advanced Training: Carlos Oliveira - colive@fe.up.pt
- SIG AI&Ed: Artificial Intelligence and Education: Daniéle Hérin - dh@lirmm.fr
- Jeirp Context: Carlos Oliveira - colive@fe.up.pt
- Learning Grid: Agathe Merceron - Agathe.Merceron@devinci.fr
- SVL: Shared Virtual Laboratory: Cyrille Desmoulins
- VDS: Virtual Doctoral School: Danièle Hérin - dh@lirmm.fr
- Trails: Peter Wood - ptw@dcs.bbk.ac.uk

Annex C: Workshop #1 in Paris - 3-4 May 2004

List of Participants

DE: FB Informatik / Saarland University: Carsten Ullrich
FR: AIDA - Crip5 / University of Paris 5: Monique Grandbastien, Jean Marc Labat
FR: GI/ESILV Léonard de Vinci : Christian Rinderknecht, Michel Scholl
FR: LIRMM / CNRS & Montpellier II University : Lylia Abrouk, Gautier Bastide, Danièle Hérin, Gaël Isoird, Patitta Suksomboon, Jonathan Touitou
FR: MeTAH/CLIPS / CNRS & University of Grenoble: Faiçal Azouaou, Cyrille Desmoulins, Dominique Mille
IT: CRMPA: Enver Sangineto
NO: InterMedia Bergen / University of Bergen: Weiqin Chen
PT: Information Technology Office / University of Porto: Carlos Olive, Joaquim Sylva
UK: London Knowledge Lab / University of London / Birbeck College: Peter Wood

Program

May 3, 2004

10:00 - 10:30 A first synthesis and definition of the effective programme

10:30-11:30 WP 25.1 - Methodologies and standards for semantic annotation of learning content: Description of metadata.

Leader: Enver Sangineto (CRMPA)

- Enver Sangineto: Presentation of the WP1
- Carsten Ullrich (Saarland): Metadata in ActiveMath
- Carlos C. Oliveira (FEUP): a Elearning Workflow
- Enver Sangineto (CRMPA): An Intelligent Web Teacher System for Learning Personalization and Semantic Web Compatibility
- Jonathan Touitou (LIRMM) "LOM and SCORM : two standards for e-learning"
- Gautier Bastide (LIRMM) "from RDF to Kaon"
- Discussion and synthesis

11:30 - 13:00 WP25.2 - Tools for semantic annotation of learning content.

Leader: Weiqin Chen (Bergen)

- Weiqin Chen: Presentation of the WP2
- Carsten Ullrich: OMDoc, a semantic knowledge representation for mathematics and Qmath
- Weiqin Chen: The annotation tool developed in Bergen, a general web-based environment.
- Cyrille Desmoulins (Grenoble) : An annotation-based computerised memory of the use of documents. A collective approach.
- Danièle Hérin (LIRMM): An example of teaching resources description with OWL. Use of Protégé.
- Lylia Abrouk (LIRMM): Representation of metadata in the water domain.
- Discussion and synthesis

13:00 – 14:30 Lunch

14:30 -15:30 WP25.3 - Organisation and storage of metadata, annotations and ontologies

Leader: Peter Wood (Birbeck)

- Peter Wood: Presentation of the WP3
- Peter Wood: Use the RDFSuite from ICS FORTH.
- Carlos C. Oliveira (FEUP): “Using the digital library system, ExLibris DigiTool, and IMS-DRI”
- Carsten Ullrich: Using LuceneDB
- Gautier Bastide & Gael Isoird (LIRMM): Using P2P and Web Service for storing and searching information for composing courses
- Patitta Suksomboon (LIRMM): “Representation of eLearning resources by S-node graph”
- Discussion and synthesis

15:30 - 16:30 WP 25.4: Current and future usages of semantic annotation of learning content.

Leader: Carsten Ullrich (Saarland)

- Agathe Merceron (ESILV): Ontologies and metadata needed by Mining of students's homework and exercises
- Carlos Oliveira (FEUP): The Library Information System (Aleph) on grey literature and eBook manuals. Using of SFX, UNIMARC and Dublin Core standards.
- Enver Sangineto (CRMPA): Exploitation of usage of learning content semantic annotations for automatic learner assessment and automatic course tailoring.
- Weiqin Chen: Using FLE (Future Learning Environment) and TopicMap
- Discussion and synthesis

16:30 - 17:00 Coffee Break

17:00 - 19:00 Parallel Sessions : Discussions on WP1 & WP2

20:00 – Dinner

May 4, 2004

9:00 - 11:00 Parallel Sessions : Discussions on WP3 & WP4

11:00 - 11:30 Coffee Break

11:30 - 13:00 Synthesis of each WP

- Harmonisation between the different WPs. Interdependencies
- Planning for the 5 last months for each WP.
- Common Bibliography

13:00 - 14:30 Lunch

14:30 - 16:30 Integration in Kaleidoscope and future work

- The Semantic Web and Elearning JPA and the others Kaleidoscope JPAs: ATA, Doctoral School, Platform, AI&Ed, Learning Grid, etc.
- The future: Definition of a common proposal
- Others proposals

Annex D: Workshop #2 in Porto - 30-31 August 2004

List of Participants

DE: FB Informatik / Saarland University: George Goguadze
FR: AIDA - Crip5 / University of Paris 5: Monique Grandbastien
FR: GI/ESILV Léonard de Vinci : Agathe Merceron
FR: LIRMM / CNRS & Montpellier II University : Danièle Hérin
FR: MeTAH/CLIPS / CNRS & University of Grenoble: Cyrille Desmoulins
IT: CRMPA: Enver Sangineto
PT: Information Technology Office / University of Porto: Carlos Olive
UK: London Knowledge Lab / University of London / Birbeck College: Peter Wood

Absent Person due to the presentation of a paper at the International Conference ITS'2004:
NO: InterMedia Bergen / University of Bergen: Weiqin Chen

Low line (Men left to right): Enver Sangineto, George Goguadze, Peter Wood, Carlos Olive, Cyrille Desmoulins, Joaquim Sylva
High line: (Women, left to right): Agathe Merceron, Monique Grandbastien, Danièle Hérin

Programme

August 30, 2004

10:00 - 11:00 Welcome and project status report

11:00-11:45 WP 25.1 Report - Methodologies and standards for semantic annotation of learning content: Description of metadata.
Enver Sangineto (CRMPA)

11:45 - 12:30 WP25.2 report - Tools for semantic annotation of learning content
Cyrille Desmoulins (Grenoble)

12:30 - 14:00 Lunch

14:00 -14:45 WP25.3 Report - Organisation and storage of metadata, annotations and ontologies
Peter Wood (Birbeck)

14:45 - 15:30 WP 25.4 Report - Current and future usages of semantic annotation of learning content
George Goguadze (Saarland)

15:30 - 16:00 Coffee Break

16:00 - 18:00 Working and Discussions Session
Define a possible integration of the works presented in an common proposal, or in a small set of proposals
Ensure a coherence between scenarios from different WPs

20:00 - Dinner

August 31, 2004

9:00 - 10:30 WP3 & WP4 Parallel Working Sessions

10:30 - 11:00 Coffee Break

11:00 - 12:30 Synthesis and WP5

- The specificity of our approach compared to existing work like Edutella or other work
- Connection with the needs of ontology evolution
- Etc.

12:30 - 14:00 Lunch

14:00 - 15:30 Continuation WP5 and proposed new joint activities
Common Bibliography, …

15:30-16:30 Outcomes to transversal KJAs
The Semantic Web and Elearning JPA and the others Kaleidoscope JPAs: ATA, Doctoral School, Platform, AI&Ed, Learning Grid, etc.

16:30 Closing