D 3.1.1 Specification of VISWE Tasks and Goals

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Abstract.
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The specification of tasks and goals of the Virtual Institute of Semantic Web Education is based on a detailed requirements analyses, which takes into account the needs of different target groups. This document outlines four scenarios, which envision education for professions, master students, PhD students, and teachers. Tasks and goals of VISWE as well as contributions of all partners are defined based on these scenarios.

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1.0	27-08-2004	Nejdl, Allert, Motta, Stutt	Partners' comments are integrated

Executive Summary

The specification of tasks and goals of the Virtual Institute of Semantic Web Education (VISWE) is based on a detailed requirements analyses, which takes into account the diverse needs of different target groups. This document outlines four scenarios, which envision education for the following target groups: professionals, master students (M.Sc.) students, postgraduate students (PhD), and teachers.
Scenario 1: "*Semantic Web Education for Professionals*" envisions providing training programs for industrial learners such as: detailed technical courses for programmers, introductory technology seminars for software architects and executives, and individual consulting on concrete proposals for project leaders. Based on this scenario a cooperation between the work packages for *Industry* and *Education* is planned.
Scenario 2: "Shared *Master Degree on Semantic Web and Ontologies*" outlines different levels of a shared master. Based on this scenario, University partners interested in cooperating on a shared M.Sc. course, specify administrative and organizational requirements as well as a curriculum.

Scenario 3: "*Communities of Practice, Ph.D. program*" goes beyond the provision of courses and training programs to support learners in less formal contexts. The learning infrastructure we intend to construct will facilitate the creation of ontology-based semantic layers over web resources to support interpretation. Furthermore we express the need for a communication infrastructure that will support synchronous and asynchronous communication. This includes tools and spaces for collaboration and communication as well as Semantic Web-based learning systems. Those will support Ph.D. students and others newcomers to the field in orienting themselves within the research community. Based on this scenario, requirements for those tools, to be designed in WP3.3, are specified.

Scenario 4: "Repository Usage" outlines the provision and usage of a suitable infrastructure for course delivery to manage and deliver learning resources. These courses are suitable for self-study as well as teaching. Cooperation with the Network of Excellence REWERSE has been started, based on this scenario.

The tasks and goals of VISWE as well as contributions of all WP3.2 partners are defined based on these scenarios which represent the detailed requirements analysis for VISWE. The scenarios are an important prerequisite for the next tasks, leading to an agreement on the organizational structure and legal form (after 12 month), the Memorandum of Understanding signed by participating partners (after 18 month), and the foundation of VISWE (after 48 month).

Contents

1. Specification of VISWE Tasks and Goals

The Task "*Specification of VISWE Tasks and Goals (as Result of a Requirements Analysis)*" is part of activity 3.1: "*Foundations for Virtual Institute for Semantic Web Education (VISWE)*". The aim of this activity is to clear the ground for the establishment of the Virtual Institute for Semantic Web Education (VISWE), by identifying the requirements for its success, its cultural and institutional contexts, and the difficulties it will face. This task will provide the basis for establishing agreement using a memorandum of understanding that will commit partner institutes to work towards overcoming these difficulties. Apart from the negotiations leading to a memorandum of understanding, the main focus is on the development of an efficient administration and infrastructure for course delivery.

Major tasks and goals of VISWE are the integration of postgraduate and professional teaching across Europe, providing administrative support for teaching activities, providing access to learning materials in Semantic web studies and providing conventional and semantic infrastructure for accessing these learning materials. Detailed tasks and goals, meeting the needs of different target groups are specified in the following scenarios.

2. Scenarios

Partners of WP3.1 wrote scenarios in order to envision education for different user groups. These scenarios served as requirements analyses. Partners discussed and refined the scenarios and specified tasks and goals based on these scenarios.

2.1 Scenario 1: Semantic Web Education for Professionals - Tasks and Goals

Main contributors and authors of this scenario are Robert Tolksdorf and Lyndon Nixon, FU Berlin.

2.1.1 Scenario

The Scenario for Professionals envisages business professionals as a target group for outreach concerning Semantic Web education and information. These are persons who are active in commercial enterprises, interested in evaluating Semantic Web technologies as potential applications to meet their business needs.

Five particular sub-groups of professionals can be identified, each with a slightly different set of interests and requirements:

- *Programmers* need technical information and hands-on training in APIs and tools.

- *Software architects* need to understand the concepts, heuristics and best practices for Semantic Web application design.
- *Project leaders* need to appreciate the benefits and pitfalls of involving Semantic Web technologies, as well as to have access to project methodologies, benchmarks, etc.
- *Executives/Managers* need to base an investment decision upon approach feasibility, cost/benefit analysis, market overview, competitive advantage, risk, etc.
- *Technology watchers* need ways to methodically monitor technological progress, push mechanisms to alert them to significant news and channels to communicate information to relevant persons.
- *Technology Consultants* need digests, short overviews, use cases, states of the art, etc.

As a result of these slight differences in focus on different types of professional, the proposed means to outreach to professionals must also differ. In terms of events, this means a choice between detailed technical courses for programmers, introductory technology seminars for software architects and executives or individual consulting on concrete proposals for project leaders. Likewise other support materials would also differ, with low-level newsletters for executives or consultants, more detailed use case descriptions for software architects and project leaders, and software guides and repositories for programmers.

2.1.2 Tasks

The tasks required of a party interested in carrying out outreach for Semantic Web technologies to the professional community can be specified as:

- Identification of the target group. Fundamentally is the outreach aimed at technology specialists or at business executives?
- Identification of the target business domain. Professionals will better appreciate and benefit from an outreach which specifically relates to the types of business problems that they face. If outreach is to be effective, it is best to focus on domains which do stand to gain some potential benefit from Semantic Web technologies.
- Creation of new learning materials. Existing materials tend to be aimed at people from the academic or research communities. The new materials should derive their content from the industrial use cases being produced in the Industry track, and hence be of direct relevance to interested professionals.
- Availability of software and prototypes for demonstration purposes. Professionals need to see that Semantic Web technologies are not just “pie in the sky” but actual, functioning and effective.
- Integrating the target group-specific material with existing (generic) material. Much Semantic Web learning material is potentially re-usable but with care that inappropriately technical or “low-level” discussion is removed or edited. Also, professionals are much less interested in future research directions in the long term as they are in what will be concretely implementable in the short term.
- Communication in relevant community circles. This can involve direct individual contact or general business contact such as “Head of R&D” (possibly co-ordinated

with the Outreach to Industry efforts), or publicizing within a certain business domain (e.g. in industry newsletters, mailing lists…).
- Formation of a group of interested individuals, who are possibly separated into their sub-groups (see above). These groups can then be built into a community through community building approaches e.g. with a mailing list, RSS content syndication, Wiki…

2.1.3 Goals

A party interested in outreach to professionals for Semantic Web technologies can consider the following points as goals for a successful outreach:
- The setting up and holding of an event for the professional community.
- The use of learning materials specifically developed for professionals in a specific business domain.
- The formation of a stable community of interested individuals for knowledge exchange.
- The promotion of synergy between the Outreach to Industry activity in KnowledgeWeb and the educational activities for professionals.
- The distribution of information to the relevant business sectors of the potential (and pitfalls?) of Semantic Web technologies for their business needs.

2.1.4 Report on Synergy between Industry and Education tracks

Prof Robert Tolksdorf and Prof Robert Meersman have made contact to discuss the possible synergies between Industry and Education tracks in the Network of Excellence "KnowledgeWeb". Mr Lyndon Nixon has also exchanged ideas with Mr Alain Leger, the leader of the Industrial Application Needs work package. It was decided that industrial use cases should be certainly shared with the educational partners in order to facilitate the production of learning materials and their use in educational events aimed at industry professionals. It was also discussed that the resulting materials as well as related demonstration material (e.g. system prototypes, mock-ups) could be placed in a repository to which industry partners could have access. Both parties agree that a conference or workshop session aimed at informing professionals about the potential benefits of Semantic Web technologies for business cases should be organised. Finally, given an adequate quality of documents resulting from the Industry work packages in KnowledgeWeb, it was decided that a book or other publication could be produced in due course.

2.2 Scenario 2: Shared Master Degree on "Semantic Web and Ontologies"

Main contributors and authors of this scenario are Enrico Franconi, Pablo Fillottrani, and Alessandro Artale, FUB. This section intends to set up a scenario for the development of a shared M.Sc. program which will be carried out and coordinated by the Virtual Institute for Semantic Web Education (VISWE). The aim is to activate "shared" M.Sc. courses on "*Semantic Web and Ontologies*" under the "*Knowledge Web*" Network of Excellence auspices. We identify here several levels of shared MSc education, from the weakest to the strongest.

2.2.1 Scenario at different levels

Free movers (level 0). Students enrolled in a MSc degree program may go to any other university to attend some course and ask for recognition of the exams from their home university. Students get just the M.Sc. degree from their home university; students should follow the rules structuring their home degree.
Students may pay the tuition fees of the visiting university (pure free mover) or may have the tuition fees waived (e.g., the fees may be paid by the "Erasmus" programme). Visiting students are granted all the facilities usually granted to students (e.g., accommodation in student halls, canteen, etc.). This is usually already possible in most European universities.

Movers under agreement (level 1). Students behave like free movers as described in level 0, but in the context of specific bilateral unidirectional agreements, that guarantee:
The recognition of studentship: i.e., the fees in the visiting universities are waived, and the access to student's facilities is granted;
The recognition of exams: the agreement contains a list of exams offered by the visiting university that are automatically recognised by the home university; this does not exclude that additional exams may be recognised at the request of the student. Students get just the MSc degree from their home university; students should follow the rules structuring their home degree.

Movers with Specialisation Diploma (level 2). Students behave like movers under agreement as described in level 1, but in the context of a co-operation agreement among some universities, so that a thematically and structurally consistent exchange of activities, exams, and supervisors among the participating universities is guaranteed. Students get just the MSc degree from their home university; students should follow the rules structuring their home degree. In addition, the students get a certification (the specialisation diploma) from the consortium stating the attendance of this particular structured form of education. Usually, a co-operation agreement contains:

- The recognition of studentship: i.e., the fees in the visiting university are waived, and the access to student's facilities is granted;
- Alternative minimal paths of exams offered by the participating universities that a student should necessarily follow in order to get the specialisation diploma, and such that they are automatically recognised by each home university.

The specialisation diploma may be released by the consortium itself - e.g., the BIT School (Bozen, Innsbruck, Trento) and the International Post-Graduate College Language

Technology and Cognitive Systems (Saarbrücken, Edinburgh) - or by an external authority - e.g., ISCA and EACL recognising the European Masters in Language and Speech.

Double degree education (level 3). Students get both the MSc degree from their home university and the MSc degree from the visiting university; students should follow the rules structuring both degrees, as specified by a detailed bilateral agreement. Students with a double degree education don't do more credits than normal students, but get two MSc degrees. The bilateral agreement contains:

- The recognition of studentship: i.e., the fees in the visiting university are waived, and the access to student's facilities is granted;
- Alternative minimal paths of exams offered by the two universities that a student should necessarily follow in order to get the two degrees, and such that they are automatically recognised by both universities.
- The guarantee that if the rules are followed, then the student gets two degrees.

This scheme is hard to achieve if the two universities have already established MSc programs which don't fully match, in terms of constraining regulations, offered exams, and established practice. An example is the double degree agreement between University of Dresden and the University of Lisbon for the MSc in Computational Logic.

Double degree education with focussed programs (level 4). This is like a double degree education as described in level 3, but with the possibility of creating brand new MSc programmes or streams tailored towards the minimisation of the matching problems that may arise in the bilateral agreement.

2.2.2 Tasks and Goals

University partners interested in cooperating to a shared M.Sc. course on Semantic Web and Ontologies started a discussion to understand the level at which the shared M.Sc. should occur. Of course, partners here start from already offered courses in order to both check similarities and differences between their offered courses and optimize the teaching effort in activating a shared MSc program. Partner Universities acknowledge study and examination achievements within the shared study program on the basis of equivalent modules, projects and the master thesis. In general, the discussion should involve mutual approval of courses and credit points, joint commissions for admitting students, administration of joint funds, exchange of lecturers, etc..
As far as course curricula are concerned these will be evaluated by the Knowledge Web partners participating on the Activity 3 "*Activities to spread excellence*" and in particulars those involved in WP3.1 "*Foundations for Virtual Institute for Semantic Web Education (VISWE)*" and WP3.2 "*Educational content and event provision*".

2.3 Scenario 3: Communities of Practice (PhD program etc.)

Main contributors and authors of this scenario are Arthur Stutt, OU and Heidrun Allert, L3S. It is important to note at the outset that while we have produced four different scenarios, by and large the same set of resources (semantic markup, discussion spaces etc.) will be needed for all of them. The main differences are in emphasis, with the different actors foregrounded in the different scenarios needing varying degrees of access to each resource type. Thus, for example, in the following scenario we foreground the needs of the relatively independent PhD student. While we consider peer group interaction, access to research material and the opportunities to participate in group projects as central for this type of learner, there will also be occasions on which he or she may need access to a relatively well structured conventional distance learning course (say, in Description Logic).

2.3.1. Scenario

As shown by the response to the first OntoWeb sponsored summer school there is great deal of demand for provision of resources to support PhD students whose research topic is the area of Semantic Web Studies. Since this is a new and developing field, few institutions can provide the range of expertise and resources needed to support their PhD students. Hence the need for a pooled set of resources as provided by a summer school or at a different scale, by the proposed Virtual Institute for Semantic Web Education.
It is also vitally important for the future of the field that we consolidate the research community in Semantic Web Studies. One way of doing this is to support the needs of the developing researcher in this area. Thus, at least in the first instance, we envisage the first VISWE learners as part of a community of widely dispersed research students.
Since we can assume that many of these students will already have had many years of formal education, the greatest need here is the provision of learning resources which can be accessed as needed by self-motivated individuals who already have a high degree of expertise both in how to go about acquiring knowledge and in a variety of specialist domains. The learning material is needed mainly to fill any gaps in the learner's knowledge and will often be at a quite advanced level. At the same time we must remember that our aim is to consolidate the Semantic Web research community. In order to do this we must provide a variety of means for peer to peer communication among often isolated individuals in order to nurture a learning community centred on the Semantic Web. Of course, as members of a Semantic Web NoE, we should look for ways to use Semantic Web technologies in building this community where possible. Finally, given the importance of implementation in our field, and as a means of making theoretical material more meaningful, it is our view that this community has access to a means of supporting collaborative work on group projects.

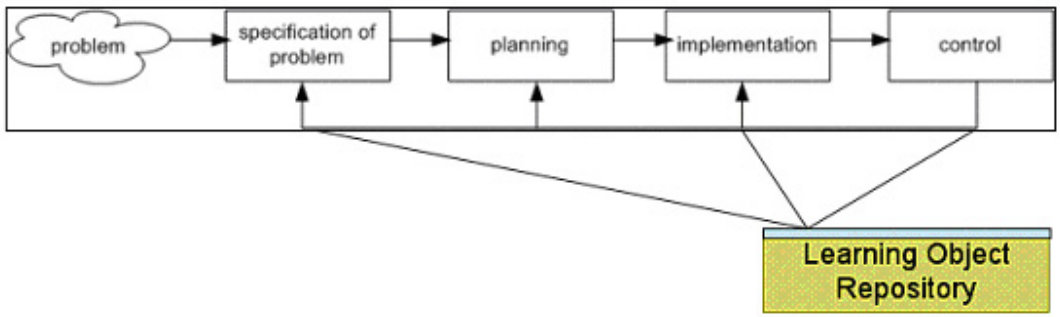

Figure 1: A project-based pedagogic strategy

Community sketch. The Semantic Web/VISWE learning community will be made up of a variety of actors (students, supervisors, tutors, examiners, administrators, coordinator etc). These actors participate in events such as thesis examinations and produce a variety of products such as literature surveys, chapter drafts, papers, theses. In order to produce these learners (and others) participate in a variety of processes or tasks: e.g., deciding on thesis topic, finding material, identifying suitable conferences, accessing information on best-practices, learning about the culture of the field, identifying experts, reading, interpreting material, writing, programming, creating knowledge.
In fact, participants in the Semantic Web learning community (as with any community of practice) will be concerned as much with the construction of cultural knowledge (information about norms and practices in a field) as with actual domain content.

Example. If we take information gathering as an example process or task for our imaginary VISWE learners, we can see that, while knowledge management systems and semantic search will go a long way, when it comes to getting up-to-date information (on say, the best journals or conferences or on the hottest domain topics), learners will usually turn to peers and those more experienced in the field for advice. In the geographically dispersed environment of VISWE, there will obviously be a need for an array of communication tools. We will need to think about how to add a semantic element to these tools (by, for example, using ontology-based search for possible communication participants).

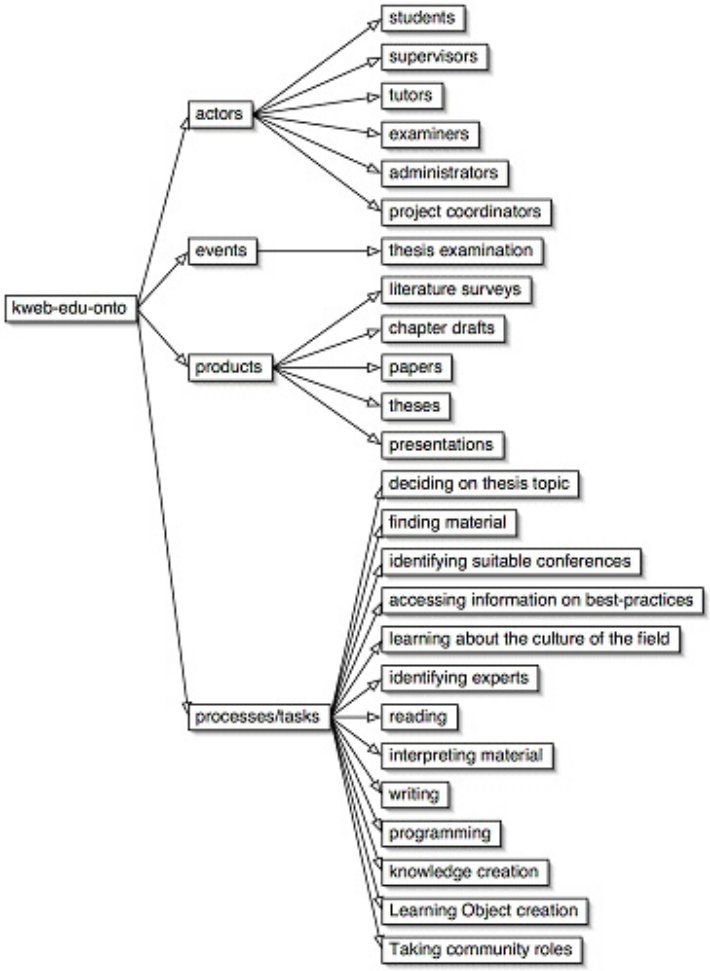

Figure 2: A sketch of an ontology for the VISWE domain

Required support. Semantic Web learning communities will thus require two types of support: for accessing material about their domain and for community building (including individual acculturation as community members). Depending on the pedagogic strategy adopted by the community actors, learning resources may be made available in a variety of ways. Self-directed learners may be satisfied with a simple repository storage and access scheme. A more formal learning approach may limit access to material to that permitted by a tightly specified course and its associated learning management system. A project-oriented approach will require that some means is available for the structuring of timely access to material. (Note that these pedagogic strategies for PhDs reflect three of our scenarios.) As well as Learning Objects, resources could include: Paper repositories, e-journals, journals, peers, post-docs, seminars on doing research, arguing, paper-writing etc.

While learning material will be accessed in this scenario (as in the others) using KMi's Magpie Semantic Browser, communication will best be facilitated by simple tools such as email, mailing lists, blogs, discussion spaces and chat or instant messaging systems. KMi can provide tools for the last three of these - respectively Rostra, D3E and BuddySpace. More sophisticated systems which give access to a combination of web based information

and chat (KMi's BuddySpace), or chat and video conferencing (KMi's Hexagon) are also available. Unfortunately we are unaware of any semantic tools for communication although KMi is currently working on combining the "push" facilities of the Magpie semantic browser with the BuddySpace tele-presence tool.

***Ontologies*.** In addition to tools for information access and communication we also need means of indexing resources, and populating the knowledge bases which can be used in reasoning about learners, events, products, processes and so on. This would be particularly important in implementing a system for controlling the project-based pedagogic approach (since this cannot be carried out by conventional learning systems). While there are a variety of ontologies available (including AKT, the OntoWeb portal ontology, and KMi's Impact ontology - an ontology describing the typical activities that a research lab member might undertake) we will almost certainly have to create a specific ontology to cover aspects of the semantic web learning community. Relying on experiences and knowledge of the field, participants will collaborate to reach an agreement on an ontology for the semantic web learning community.

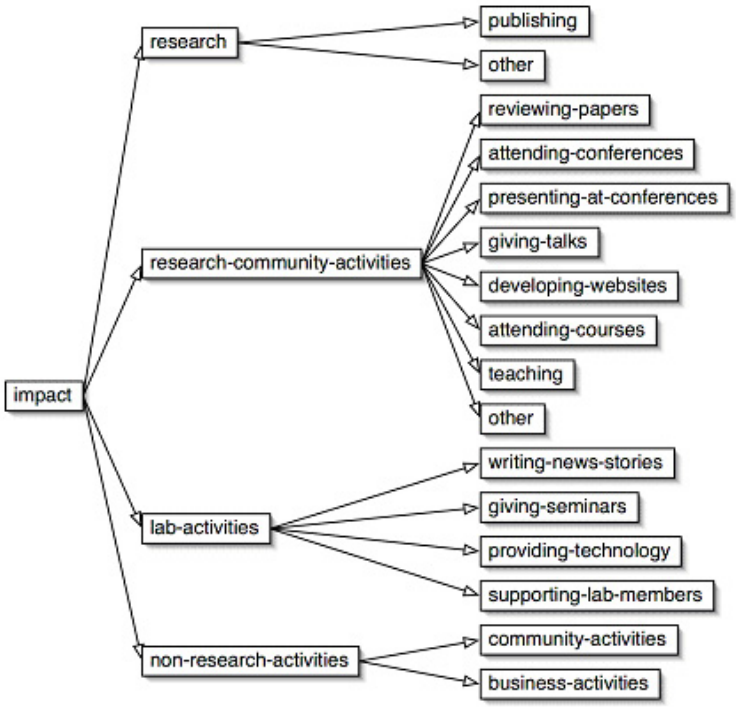

Figure 3: Part of KMi's Impact Ontology

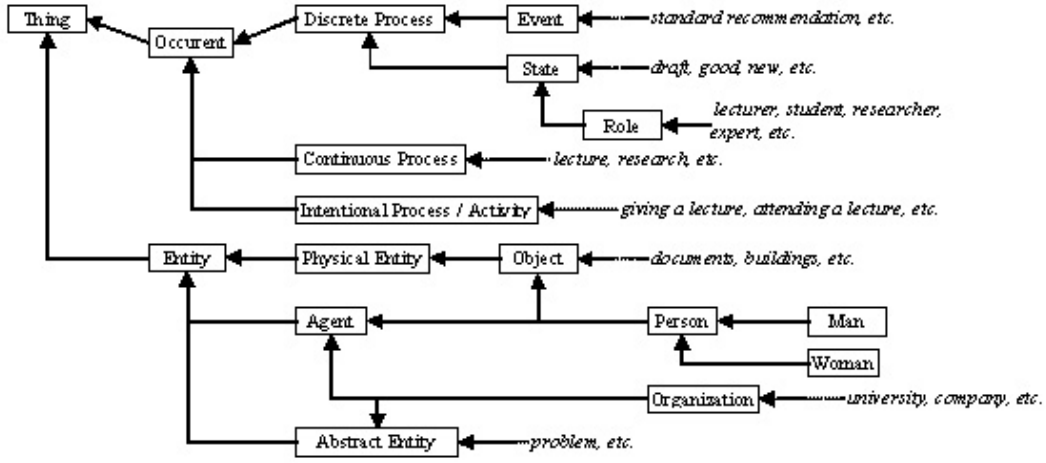

Figure 4: Top-ontology of concepts in the field of learning, provided by INRIA

Tasks and Goals

- Support for accessing learning material will require both the selection of a conventional repository and the development of a semantic learning platform.
- Support for intra-group communication will require the identification of suitable tools for conversation, shared discussion and so on. If possible, tools using semantic technologies should be used.
- An ontology (or ontologies) covering the domain of Semantic Web studies will need to be developed for indexing resources and grounding semantic tools.

2.4 Scenario 4: Repository Usage

Main contributor and author of this scenario is Wolf Siberski, L3S. The repository usage scenario focuses not on a specific learning purpose. Instead, the goal is to give all users optimal access to the available materials regardless of their learning context.

2.4.1 Scenario and Requirements

While this scenario doesn't have a strictly delimited target group, we foresee at least the following user groups:

- Teachers who want to include high-quality material developed by others into their courses.
- Learners who look for material for self-study. Note that for advanced learners this doesn't necessarily mean that the learning units are designed for self-study.

In this scenario the following requirements are the most important:

- Advanced search facilities to search not only for complete courses, but also for specific topics which are covered in parts of courses
- Availability of learning units in widespread formats (to ease integration into other contexts)
- (Preferably) availability of editable version

- (Preferably) relatively small self-contained learning units with little dependency on original context

2.4.2 Implementation and Maintenance

This scenario has already been implemented, is maintained, and enhanced continuously. A survey collected the courses available within the consortium of partners (cp. WP3.2) The ARIADNE and the EducaNext Portal for Learning Resources have been installed: <http://ubp.learninglab.uni-hannover.de:3100/EducaNext/ ubp>, <http://kps.learninglab.uni-hannover.de:3000/silo/>, and <http://kps.learninglab.uni-hannover.de:3000/kpsmanager/>. Partners provide courses and learning resources. Thus the Educational Area provides content from early on, i.e. within the first 6 months. The courses provided are suitable for self-study as well as teaching.

Furthermore cooperation with the Network of Excellence REWERSE has been started, based on this scenario.

Next Steps

Scenarios within WP3.1 served as a medium for conducting a detailed requirements analysis for VISWE based on the investigation of prior attempts ((e.g. IVIMEDS, BIT); legal implications/instruments; relation to Bologna Declaration for creating a "European higher education area"; lessons learnt from first OntoWeb Summer School). The scenarios furthermore are an important prerequisite for the next tasks: the "*Negotiations among Universities" (*financial, copyright, personnel implications, mutual approval of course credit points, memoranda of understanding) and the "*Investigation of the feasibility of participating in other European development and training programs"* (e.g., Marie Curie, Leonardo, Athens, Socrates).

At the Educational Area meeting in September, partners will discuss the agreement on organizational structure and legal form in order to prepare the deliverable D*3.1.2"Document on organizational structure and legal form of VISWE to which all participating partners have agreed",* which will be delivered after 12 month.