



E/T-D4

Design of the Educational Infrastructure

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Abstract

This deliverable presents the technical solutions and organisational measures needed to create the educational infrastructure for academics as well as for professionals. The deliverable is a joint deliverable between “Education and Training” (ET) and “Technology Transfer & Awareness” (TTA) since the educational infrastructure is a task which needs to be addressed by both work packages. The deliverable reports on the different target groups and their requirements together with an analysis of existing learning management systems and a discussion, why we have adopted a system based on the EducaNext system.

Keyword List

Learning repository, educational infrastructure

Design of the Educational Infrastructure

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This deliverable presents the technical solutions and organisational measures needed to create the educational infrastructure for academics as well as for professionals. The deliverable is a joint deliverable between “Education and Training” (ET) and “Technology Transfer & Awareness” (TTA) since the educational infrastructure is a task which needs to be addressed by both work packages. The deliverable reports on the different target groups and their requirements together with an analysis of existing learning management systems and a discussion, why we have adopted a system based on the EducaNext system.

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1. Introduction

This deliverable presents the technical solutions and organisational measures needed to create the training infrastructure for academics as well as for professionals. The deliverable is a joint deliverable between “Education and Training” (ET) and “Technology Transfer & Awareness” (TTA) since the educational infrastructure is a task which needs to be addressed by both work packages. As the difference between the work packages lies mainly in the different target groups, those will be explained in more detail in the following.

1.1. Target groups

The training infrastructure to be created will have two main groups of users: Those who consume learning resources and those who provide them. Both have different requirements on the infrastructure which will be addressed below. Within these two groups, a differentiation can be made between people from public institutions (e.g. universities) and from industry. This basically reflects the different target groups for the ET working group (people from public institutions) and the TTA working group (professionals from the industry). Therefore, the following classification of target groups will be used in this deliverable:

Consumers of learning resources:

1. Consumers from the education area: People from public institutions (universities):
Comprising MSc / PhD students, but also teachers / researchers from other research areas
2. Consumers from the industry area: Professionals from companies
This may comprise two subgroups:
 - a. Consumers within the company (internal usage), i.e. the learning resource is used within a company to educate the staff
 - b. Customers of the company (external usage), i.e. the learning resource is acquired by a professional education company which in turn then educates their customers

Providers of learning resources:

3. Providers from the education area: People from public institutions (university teachers, researchers)
4. Providers from the industry area: People from professional education companies

In general, the providers prepare material for a specific target group, e.g. the providers from the education area usually have learning resources for consumers from the education area and the providers from the industry area usually prepare the learning resources for consumers from the industry area. However, there are also providers from the education area offering learning material for the industry, so we cannot keep both areas, public institutions and companies, strictly separated. Therefore, we propose to build a single training infrastructure for both target groups.

2. Requirement analysis

The goal of the requirement analysis is to find out what REWERSE should offer to professionals and academics as training infrastructure. This is important because academics and professionals are different target groups and the different requirements of these groups have to be taken into account. As a side effect, this section will also analyse the REWERSE content (and form of delivery) of the learning material, which need to be adapted to the specific target groups. However, the main objective of this section is to find the requirements on the infrastructure, not the specific content to be delivered to a specific target group.

2.1. Consumers of learning resources

2.1.1. Education area

In general, typical education area consumers are students on different levels:

- MSc students
- PhD students

On the content level, MSc students require a well-prepared introduction to the topics to achieve a good overview over the whole field. This material is typically used in directed-learning scenarios (lectures) where the lecturer determines the speed of learning. For the training infrastructure, this results in learning material which is typically organized in courses.

PhD students typically have more background knowledge for the topic to be studied so on the content level they require less introductions and more technical details. The learning model is either similar to the one of MSc students (if they attend PhD courses) or they have to work and learn on their own (self-directed learning). These differences in the requirement on the content of the learning resources lead to the fact that learning resources for PhD students should not be structured as a course in a training infrastructure, but more according to the topics offered. Furthermore, there is a need for more connections towards further learning resources, so that the PhD student can explore the research area more easily. This requires an effective and efficient search facility in the training infrastructure, not only to find appropriate learning resources, but also to find further material such as highly-active researchers in a specific field.

Even teachers can become consumers when they want to use foreign educational resources in their lectures. This is useful, for example, in case a teacher has to start a new lecture and, thus, requires supportive material (slides etc.). In this case, it would be time-saving if the teacher could utilize material, for example, from a well-known expert in that area. So there is again a need for an efficient search mechanism. Furthermore, if this material is actually available in the training infrastructure, it is important to know about its copyright situation, i.e. if other people are allowed to use it / modify it etc.

2.1.2. Industry area

In the industry area, there are several target groups with very different specific requirements.

Technology monitors

Technology monitors are coming out of companies' research & development departments. On the content level, they first need an overview of the ideas and concepts and not yet in-depth tutorials or complete courses. Because they have to monitor many technologies, they usually only have limited time for each topic which interests them to inform themselves. This results in a three-step scheme to support this target group:

1. Attract interest in the topic (e.g. by advertisements in magazines (such as iX, c't), newspaper articles, flyers, web pages). Technology monitors inform themselves independently.
2. Provide overview material

This could be achieved through:

- A web-based introductory course (overview-like summary): probably only one such course will be offered. The course needs to be an instruction for beginners and need to be a catcher (that is, it needs to incite their interest). No administrative effort is wished for. The registration process needs to be easy (if necessary at all) and should pose no hindrance.
 - General overview courses (e.g. collection of Power Point slides)
3. Provide pointers to in-depth material (e.g. tutorials of few hours) / further contacts
 - Necessary if the overview material has caught the interest of the technology monitor
 - Contacts to relevant persons / communities in the area which could offer consultancy: Workshops and events such as the planned awareness event 2005 could be used to attract interest for personal meetings. Consulting then should be based on information provided in the form of learning modules, which could be stored in the training infrastructure.

A training infrastructure could be provided for the material in steps 2 and 3, but it is important to note that technology monitors mainly need a fast and simple access to the relevant information (the introductory courses, the contact information, information about further events etc.).

Executives & managers

Executives and managers in general become involved after the technology monitors have identified a technology as relevant for the company. But they could also be involved before anyone else has identified the technology as relevant as it is important that they hold a positive attitude towards the technology. Only with a positive attitude they will create the possibility for the company to engage in REWERSE related activities.

Executives & managers need more concrete data about:

- An analysis of the cost and the time required for educating the staff of the company in this technology in order to introduce the technology afterwards
- The concrete advantages and relevance of the technology
 - What does the company gain when it acquires the know-how for the technology (education)?
- Contacts for good education possibilities (e.g. information about the education facilities provided by REWERSE)

This information can be provided by marketing and by short overview web sites or guided tours but a training infrastructure is not suited for this target group.

Programmers

On the content level, programmers need at first introductory courses, when they get in contact with a new technology. This material is similar to what students need though they require more examples and the material needs to be more practically oriented and based on problem cases they can relate to. This is because programmers need to see very quickly whether the technology is applicable to their problem at hand. In the second step, programmers require in-depth and up-to-date technical information about the specific technology.

Regarding the training infrastructure, the requirements are similar than for the target group 'students' for the introductory courses. The in-depth technical documentation should be easy

to search and to cross-reference with other documentation (the amount of information and finding the relevant one for a specific purpose is the main problem). Regarding the training infrastructure, the main focus is providing the content, there is no need for any specific styling.

Open Source Community

The open source community has similar requirements than the programmers. Besides short overview material, they need in-depth technical documentation which is easy to search and cross-references with other documents. Consequently, the purpose of a training infrastructure lies mainly in providing content. Additionally, open source programmers in general also need contact possibilities to discuss technical issues.

Professional teachers

For professional education companies, which want to make use of educational resources for their own education activities, it is important to know about the copyright situation for a specific resource. Furthermore, it might be important to have support for different closed communities, so that the distribution of learning material can be restricted to a certain group.

2.1.3. Summary

The consumers of learning resources in REVERSE come from many different target groups and require different support. We currently envision a two-step model:

- Overview (high-level) material is stored on well-organized web pages
 - This is mainly for becoming informed quickly about Semantic Web issues and new developments in this area
- In-depth material should be stored in a training infrastructure, which provides means for efficiently finding the necessary learning resources
 - This might require more complex mechanisms for registration etc. to better support the consumer (e.g. using personalization and user profiles)

Thus, for industry, we need hands-on training and technical info (provided in the form of face-to-face seminars and E-Learning material), we do not need a learning management system. Most of the user groups can be supported well by a repository of learning material.

2.2. Providers of learning resources

2.2.1. Education area

Providers of learning resources have different requirements than the consumers. The main problem for providers at universities is that there is currently no true incentive to insert educational resources. This is because there is typically already an existing channel for distributing learning resources at universities (paper scripts, password-protected web pages etc.). Thus, an easy-to-use interface is necessary not to hinder those providers, who are willing to add their resources to the REVERSE training infrastructure. If the training infrastructures has been shown to be useful, facilities for updating the resources easily should be also provided in the training infrastructure. Furthermore, individual copyrights should be possible to enable each provider to use his/her own licence for sharing the learning material.

2.2.2. Industry area

Though the industry area is most likely focusing on consuming learning resources, they might also become a provider (= professional education companies). However, they will only provide material if copyright issues can be handled in a flexible way and if they can restrict

the access to the material to a certain community. An incentive for them might be to be able to use our platform as a means to promote themselves to a certain community.

2.3. Technical requirements

The technical requirements on the training infrastructure are two-folded: Administration-related requirements and search-related requirements.

Regarding administration, the infrastructure should comprise a simple user administration and an easy administration for storing the resources in the repository. This is important to be able to put as much time and effort as possible into the main work packages of the education / the technology transfer work package.

Regarding search functions, it is important that we can annotate the learning material with metadata and that we have an appropriate metadata model of the training infrastructure to realize the envisioned semantic platform for delivering / interacting with the learning resources. In this respect, it is also important to refer to accredited metadata standards to create learning material which can be used on a wide range of systems and platforms also in the future (to avoid that content is trapped in proprietary formats).

2.4. Summary

As a result of the previous analysis, there are many common requirements among the different target groups. The main requirements on the training infrastructure are:

- Means for easy storing, searching and retrieving learning material (repository functions)
 - Example: The complexity to insert resources should be rather low in order to get a good and comprehensive collection of learning resources
- Means for easy user administration
- Support for different learning scenarios (web-based courses, self-directed learning, communities...)
- Support for metadata annotations of the learning material
 - Changes in the metadata scheme should be supported if it turns out during the REWERSE project that some metadata is missing for the semantic platform
 - Use of accredited (metadata-) standards
- Support for different copyright models

Basically, a simple repository of learning resources which allows for annotations with metadata is useful for most groups, not a full-fledged learning management system. In a two-step model, this conventional infrastructure could be extended with Semantic Web features to the envisioned semantic platform.

Apart from the technical requirements on the training infrastructure, the focus should lie on the content of the learning material (the quality of content is more important than the quantity, especially for learning material intended for industrial education).

3. Technical solution: Training infrastructure

This section analyses existing applications based on the above mentioned requirements in order to be able to reuse existing technology to avoid duplicate work (if possible).

3.1. Analysis of existing learning platforms

We examined four different systems which appeared to be appropriate for our purposes. In the following, we focus on the above requirements and do not provide an exhaustive description of each system.

3.1.1. CLIX

CLIX is a learning content management system including¹:

- User management & access control
- Learning process management
- Communication & collaboration (chat room, bulletin boards,...)
- Advanced testing, assessment and evaluation
- Workforce analytics
- Competency & skill management
- Resource management (e.g. version management for the resource provider)

A provider needs to take a 2-days training in order to be able to provide one course. This is because of the complex procedure for uploading courses, which involves many forms to be filled in. Furthermore, time is necessary to define the learning logic. Also, the course material can not be changed anymore once the course is running.

For the administration of the CLIX system, also a special training is required as this involves the creation of templates, for example, for the metadata, before providers can actually upload their data.

3.1.2. Ilias

Ilias is an integrated learning-, information- and cooperative working system (focusing on cooperative working). It is, for example, used within the ELAN project

(<http://www.13s.de/elan>) It is an open source project and a direct competitor of CLIX. Though Ilias initially was used at universities only, companies now also make use of it.

The time to invest for uploading a learning resources is about 2 days (the complexity of Ilias is comparable to the one of CLIX as both comprise roughly the same functionality).

3.1.3. Ariadne

Ariadne is a project which can provide servers for educational resources. According to the Ariadne Strategy document², the project aims to develop and exploit the Knowledge Pool System to “enable a “share and reuse” approach for education and training”. The project also provides the Web-Based Learning Environment (WebLE) for displaying learning objects and a set of authoring tools for creating learning objects.

¹ Information taken from <http://www.adlnet.org/index.cfm?fuseaction=rcdetails&libid=693&bc=false>

² Available from <http://www.ariadne-eu.org/en/about/general/Ariadne%20Strategy%20Paper.html>



Ariadne is a document management system without community features. The time to invest for uploading a document is 3 forms (cf. KnowledgeWeb deliverable D3.3.2v1).

3.1.4. EducaNext

The EducaNext portal is powered by the Universal Brokerage Platform, a commercial spin-off product from the UNIVERSAL project (contact University of Wien). It is a document management system which has easy to use web interfaces for browsing resources and entering metadata. For example, uploading a new resources requires to fill in 5 forms. It also comprises some, albeit primitive, support for communities. Learning resources can be stored either directly in EducaNext or as a pointer to another web page.

The Universal Brokerage Platform has been developed by the Universal consortium. According to the brochure³ the UBP has the following advantages:

- First web-based application supporting exchange transactions for knowledge resources. The UBP supports the protection of Intellectual Property Rights (IPR) and provides means for catalogue management, resource evaluation and annotation.
- Customisable Business Model. Knowledge resource providers can offer their learning resources under fully customisable copyright conditions ranging from open-content license agreements to full-fledged contracts. The offers can be targeted to specific users, institutions or alliances of institutions.
- Conformity with standards. The UBP development team is working closely with the leading educational standards making bodies like IEEE, IMS, and Cen/Isss. The platform metadata model is based on a careful selection of Dublin Core and IEEE LOM attributes, which is mapped into XML/RDF.
- Based on open source software. The UBP is a product with low maintenance costs, which can be implemented on open source components such as the Phoenix Firebird Database, the Apache Web Server and the TomCat Servlet Engine. Nevertheless, UBP can be also be built on commercial systems, for example the Oracle 8i DBMS.
- Open interfaces. Based on web-services the UBP offers a variety of open interfaces for user registration, resource provision, booking and access control. This flexibility helps to keep integration and adaptation costs low. The type of delivery systems supported range from simple web servers and streaming media servers to video conferencing tools (Isabel) and sophisticated learning management systems such as IMC's Clix.

Regarding metadata, there are in essence three top level categories: General Information, Technical Information and Educational Information. Included in the first of these is a

³ EducaNext brochure http://www.estandart.no/docs/meetings/UBP_engl_INF_WUW.pdf

description of the discipline to which the resource belongs. In the default case, the Dutch Basic Classification System is used. However, it is possible to add other systems.

3.2. Discussion

CLIX and Ilias are full-fledged learning management systems, which are very complex. For our goals, the authoring environment or the learning environment are not required, but especially the time necessary to upload learning resources is way too long to make people from universities volunteer in providing resources. Another problem are the necessary efforts for user administration. Thus, both are not suited for the REWERSE purposes. In contrast, Ariadne and EducaNext are less complex and EducaNext has a slightly better handling of copyright issues.



Therefore, according to our analysis, the EducaNext System is best suited for both target groups of TTA and ET. This way, REWERSE sees the same advantages in using EducaNext than KnowledgeWeb, which have also decided to build a platform based on EducaNext. Thus, REWERSE also adopts EducaNext and shares the infrastructure with KnowledgeWeb. This is in accordance to the deliverable E-D2, which regulates the cooperation between REWERSE and KnowledgeWeb regarding VISWE and the VISWE repository. The Ariadne system will be kept as a backup solution.

4. Organizational measures for creating the training infrastructure

There are few organizational measures necessary for the training infrastructure:

- There must be an institution who will host the infrastructure (user management etc.)
 - This is done by the partner Hanover
 - After the project ends, the VISWE foundation will host VISWER
- There must be a sufficient degree of support for consumers and providers
 - Especially for providers to support them in uploading their material
 - A 'howto' for how to insert learning resources is necessary
- For consumers, marketing is necessary to create awareness of the platform. Regarding industry, the marketing channels which have been built up so far in the "Technology Transfer & Awareness" activity will be used.

5. Implementation work plan for the next 18 month

A first running version of the educational infrastructure is supposed to be ready in M18 (Deliverable E-D6 And T-D6), including instructions for authors about how to insert learning resources into the infrastructure. Special care will be taken regarding the interface design in reference to the target group industry. It must be easy for them to find what they are looking for on the platform. A first set of courses from REWERSE members is expected to be available on the infrastructure at that time, as well.

For month 30, a report on the usage and the further development of the infrastructure and the contained learning resources will be prepared. The further development consequently will be based on the feedback received from the consumers and providers of the learning resources. An extension of the infrastructure with Semantic Web technology might be considered at this point in time. The report will also comprise an updated work plan for the integration of other courses of the graduate curriculum, including industrial courses.

6. Summary

The contributions of this document are:

- Classification of the expected user groups for the REWERSE training infrastructure
 - Consumers and providers from public and industry area
- Analysis of the requirements for the different user groups on the infrastructure
 - Means for easy storing, searching and retrieving learning material
 - Means for easy user administration
 - Support for different learning scenarios (web-based courses, self-directed learning, communities...)
 - Support for meta-data annotations of the learning material
 - Support for different copyright models
- Analysis of existing platforms regarding the mentioned requirements

As a result, the EducaNext platform is the best suited one and it has also been selected by the KnowledgeWeb education area, which enables sharing the platform between both Networks of Excellence. This shared platform is called VISWER (the VISWE repository) and can be reached at <http://ubp.l3s.uni-hannover.de/ubp>.

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