



D3.1.4 Requirements for a joint infrastructure

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Abstract.

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The intention of this deliverable is to collect all requirements on the joint infrastructure for the education area, namely the requirements from the industry area, requirements regarding the accessibility of REASE, requirements regarding the joint usage of the infrastructure with other NoEs such as REVERSE and AgentLinkIII, and requirements regarding the quality management. We also provide an analysis of pedagogical requirements, which will be the basis for future versions of the infrastructure.

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Executive Summary

The intention of this deliverable is to collect all requirements on the joint infrastructure for the education area, which is called 'Repository of EASE for Learning Units' (REASE) and is available at <http://ubp.l3s.uni-hannover.de/ubp>. This name replaces the old name 'VISWE repository' (VISWER), which had to be dropped due to legal reasons. The deliverable discusses requirements from the industry area, requirements regarding the accessibility of REASE, requirements regarding the joint usage of the infrastructure with other NoEs such as REVERSE and AgentLinkIII, and requirements regarding the quality management. We also provide an analysis of pedagogical requirements, which will be the basis for future versions of the infrastructure.

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1 Introduction

The intention of this deliverable is to collect all requirements on the joint infrastructure for the education area, namely the requirements from the industry area, requirements regarding the accessibility of REASE, requirements regarding the joint usage of the infrastructure with other NoEs such as REWERSE and AgentLinkIII, and requirements regarding the quality management. We also provide an analysis of pedagogical requirements, which will be the basis for future versions of the infrastructure.

2 Requirements from the KnowledgeWeb Industry Area

Persons from industry, who are interested in Semantic Web technologies, require at first brief and concise information about the Semantic Web. Such material should be easily accessible with only a few mouse clicks. As the REASE platform requires several mouse clicks to reach material, we have decided to split up the material between the Outreach-to-industry (O2I) portal and REASE:

1. High-level introductory material, which comprises fact-sheets and further information which need to be easily accessible (very few mouse clicks, no registration), is intended to be kept on the O2I portal.
2. In-depth material (tutorials, courses, etc.) is intended to be stored in REASE to allow for an efficient search and to enable the implementation of copyright and licensing issues, which are in the interest of the material provider.

This way, it is possible to have a single infrastructure for the in-depth material, which however requires a registration in order to be able to use it, while providing a simple access mechanism for high-level material directly on the O2I portal.

3 Requirements from other NoEs

The Semantic Web curriculum to be designed by the REWERSE NoE will be used as a basis for the catalogue of REASE. Therefore, the catalogue of REASE will have to be adapted. Since this affects the classification of already existing material in REASE, we will try to automatically reclassify the material as far as possible. However, the authors can reclassify their material as a final step.

The “Technology Transfer Area” of REWERSE also comprises the creation of learning units especially suited to industry, which should also be stored in REASE. Thus, REASE will also store high-level material for REWERSE, with more burden on the user regarding registration, as mentioned in Section 2.

Further requirements may arise in the following months when the cooperation with the other NoEs will be intensified.

4 Requirements regarding Accessibility

4.1 Introduction

Accessibility is a crucial but often overlooked factor in the design of good websites, portals and software in general. Accessibility is not about designing specifically for people with disabilities, but about making things both easy to use and useful for everyone, regardless of the method in which they access it [Maynard05]. For example, people accessing the internet or web-enabled software via different modalities such as PDA or mobile phone are particularly susceptible to the problems caused by inattention to accessibility of design.

Furthermore, inaccessible websites are rarely future-proof, i.e. they do not withstand the test of time, as users easily become annoyed by an inaccessible design and will turn to alternative websites as soon as possible. Accessibility covers many different issues, for example: design and appearance (fonts, colours, spacing, layout), use of hypertext, navigation ease, mystery meat navigation, appropriate use of images, sound and colour, aesthetics, formats for interactive behaviour (form filling, checkboxes, radio buttons, etc.), alternative modes of use, keyboard shortcuts and other mouse alternatives, ability to modify the setup, speed of familiarity acquisition, compliance with existing standards and so on.

4.2 Legal implications

Not only does a lack of accessibility limit the potential size of the user group, and actively antagonise those whom it affects, but it also has many legal implications.

The EU Directive establishing a general framework for equal treatment in employment and occupation (Directive 2000/78/EC) was adopted in November 2000 (EU0102295F). This aims to create a general framework targeting discrimination on the grounds of religion or belief, disability, age; and sexual orientation, with respect to employment.

In the UK, this Directive has led to the amendment of the Disability Discrimination Act (DDA) 1995. The amendments on disability have been established since 1 October 2004. As stated in the DDA Code of Practice¹, which specifically mentions websites, "The Disability Discrimination Act makes it unlawful for a service provider to discriminate against a disabled person by refusing to provide any service which it provides to members of the public". Examples of services affected by the DDA include "an airline company [which] provides a flight reservation and booking service to the public on its website." It also specifically mentions accessible websites in the context of people with visual and hearing disabilities.

¹ <http://www.drc-gb.org/open4all/law/Code\%20of\%20Practice.pdf>

4.3 Accessibility analysis of REASE

In the light of these issues, we analysed the first version of REASE, the Repository of EASE for learning units, for accessibility issues, and have been attempting to resolve any problems which came to light.

4.3.1 Fonts and Colours

Some of the original colours used were not well designed. The most accessible colours to use are combinations of light/dark (light on dark or dark on light). For people with vision problems, no amount of increasing the font size can compensate for unreadable colour combinations.

We found 3 main problems with colours in the original design:

- white on yellow/orange for the "Advanced Search";
- white on grey for the main part of the home page;
- black on dark green for the sidebar on the left.

Good points regarding colour design were:

- white on dark green for the left hand sidebar;
- black on white on the right hand sidebar.

4.3.2 Images

The following problems were noted with respect to images:

- The symbol to access the statistics page was unclear as to what it represented, and it was unclear that it was a link.
- The arrow to the right of the search box was very small, and could not be made bigger. While it does have an ALT tag, enabling the user to see a descriptive label on mouseover, the problem remains that if it represents something to be clicked on, it should be big enough that it's easy to click. This is important not just for people with sight problems, but for people with motor problems, for example.
- The REASE logo itself is hard to read because of its blocky design. Given that this image includes the name of the REASE and what it stands for, this is a problem because it cannot be made bigger by increasing the font size, and this information is not to be found (as a title) anywhere else on the page. It was therefore suggested to add the text REASE (and the expansion of the acronym) as a title on the main page, and also to provide ALT text for the image.

4.3.3 Navigation

Most of the navigation was clear and well designed. However, there was one problem with links and underlining, which was not consistent. One of the standard accessibility rules is that links should be underlined wherever possible / practical (not just on mouseover), and that items which are not links (e.g. headings) should not be underlined. Not only does it make it more obvious what is a link and what is not, without having to mouse over an item to discover this, it also provides the user with the ability to distinguish previously visited links from unvisited links. Links which are identified solely

by colour do not provide this, and can also be problematic for people with vision and colour problems.

Secondly, some links to non-existent pages were detected. These should be removed until the relevant pages exist.

4.3.4 Catalogue

Some layout and navigation problems were detected in the REASE catalogue.

- It was not clear that the blank boxes at the top of each column were search boxes, until mouseover. This is an example of mystery meat navigation, and should be avoided.
- The ranking system is unclear and is not explained anywhere.
- The arrows were small, and the white on green arrows for previous/next page are not only small, but a poor choice of colour combination from a visibility point of view. It was suggested to make them thicker and larger.
- It was also not clear that the Search boxes on the home page (rather than on the catalogue page) refer only to the catalogue and not to the website as a whole, especially given their position on the top right hand corner of the main page. It was suggested to change the description to make this clearer.

4.3.5 Links Page

On the "Collection of Links" page, the colour of the headers (links) and descriptions was almost the same, making it very hard to differentiate between them. The same observations made in the previous sections about colours and links apply here.

4.3.6 Ariadne System

As described in D3.3.2v2, ARIADNE is the backup repository, which we automatically duplicate the metadata introduced in REASE.

When analysing the Ariadne web pages, there were 2 main navigational issues.

- The search facility seems to be a different kind of search from the Catalogue Search available from the main page, but it is not obvious if there is a difference and if so, what the difference is.
- There should be a way to return from the Ariadne page to the main REASE page (or alternatively for it to open in a new window by default).

4.4 Issues resolved

4.4.1 Fonts and colors

We adapted a new design of the colors taking the above mentioned requirements regarding a high contrast into account. All issues should be resolved.

4.4.2 Images

- The symbol for the statistics was removed since the system had to be switched off for security reasons.
- The symbol to activate a search was enlarged as far as the current page design allowed.
- An alt tag was added to the REASE logo and the title of the main web page was changed to include REASE as a name.

4.4.3 Navigation

All links are underlined now by default and there should be no more links to non-existing pages.

4.4.4 Catalogue

- The search boxes in the catalogue now have an explaining label.
- The search box on the main page was renamed to 'search catalogue'
- The ranking system basically ranks the resources to the number of bookings per resources. The resource with the highest number of bookings is ranked highest.
- The colors of the arrows were changed and the arrows were made thicker and were enlarged.

4.4.5 Links page

The colors of the headers and links were adapted to the overall improved design.

4.4.6 Ariadne System

The Ariadne system is a backup system for research and is not intended for use in production and is not adapted in the design. However, for an easier return to the REASE pages, a new window is now opened when using Ariadne.

5 Requirements on Quality Management

The material to be stored in REASE has to undergo a review process in order to ensure the high quality of the material stored on the platform. The quality of each learning unit is related to two major areas: technical requirements (such as non-proprietary file formats) and requirements regarding the content (for example, if the learning unit is related to Semantic Web topics). A more detailed discussion of the requirements on the learning units will be published in D3.1.5.

This quality management process has to be effective and efficient. Therefore, REASE is required to support this process, which is already partly available: Each time an author publishes a new learning unit / updates an existing one, the administrator of REASE has to approve the changes. In this manner, we can avoid the publication of low-quality material. This is a sustainable approach regarding the number of learning units and the expected low frequency of updates.

The fulfilment of the technical requirements is as often as possible ensured automatically. For example, the most important metadata fields describing the learning units are mandatory such that REASE will not accept a new learning unit without these metadata fields being filled in. For the remaining requirements, we envision the following process:

1. The REASE administrator verifies the remaining technical requirements (those that cannot / can only be validated automatically with difficulty).
2. He also assesses the content of each resource to filter out the non-borderline cases. These include, on the one hand, learning units from KnowledgeWeb partners or cooperating NoEs, which have a very high probability of being excellent and can thus be assumed to match the content requirements. On the other hand, the administrator can also easily filter out ‘spammers’, who try to use the platform for exchanging material completely unrelated to Semantic Web topics.
3. For borderline cases, we will install an editorial board that will review the remaining units for their suitability to REASE. This review will be in accordance with the quality guidelines, which are part of D3.1.5.

Finally, some material is expected to be highlighted using some kind of ‘KnowledgeWeb certificate’, which can either be requested by other members of KnowledgeWeb (for example, if they have successfully used the material for their own courses) or by other REASE users, who can express their opinion of the material using the REASE feedback mechanism and rating scheme. This feedback mechanism is currently, however, non-public and might be extended to become public.

Depending on the different communities represented in KnowledgeWeb (Description Logics, Ontology Engineering,...), we also envision recommendations for reading, which might be different depending on the community. These recommendations might be generated automatically / semi-automatically, depending on the advanced semantic platform for learning (ASPL), which will be developed in WP3.3.

6 Requirements on the name of the repository

The initial name of the platform was VISWER: the VISWE repository of learning units, with VISWE being the Virtual Institute for Semantic Web Education. However, the name of VISWE had to be changed for the following reason: It should be founded in Hanover, which is a university town in Germany, where it is not allowed to found associations having ‘institute’ in the name of the association. This is to avoid the possibility that associations can pretend to be part of the university. Therefore, VISWE was renamed to the ‘European Association of Semantic Web Education’ with the acronym ‘EASE’. As a consequence, VISWER was renamed to REASE, the repository of EASE for learning units.

7 Pedagogical requirements

It is our view that any repository of material for learning or infrastructure which is intended to support learning must be assessable in terms of some set of pedagogic principles or view of what is required for learning. We do not intend to develop a full set of quality management criteria in this report since this will be discussed as part of deliverable D3.1.5 (see section 5 above). However, it is essential that we develop a pedagogic framework and discuss to what extent REASE (and its content) fits into it. As well as possibly informing the quality management criteria, this framework may also form part of the evaluation process of the ASPL platform which will complement REASE.

While there are innumerable possible pedagogic views in the literature, we have adopted a skills-oriented framework based on the work of Bloom.

Bloom's taxonomy (Bloom, 1965; Dzbor, Motta and Stutt, 2005) is widely used in learning theory. His 'taxonomy' includes affective and psychomotor as well as cognitive activities or skills. We will concentrate on the cognitive although we hold the view that all of the different types of skill are involved in learning. For example, a pleasing graphical illustration of some concept may aid understanding. It is also clear that skills from different categories are related. It is obvious from Figure 7.1 that affective skills such as internalizing values are related to cognitive skills such as evaluation.

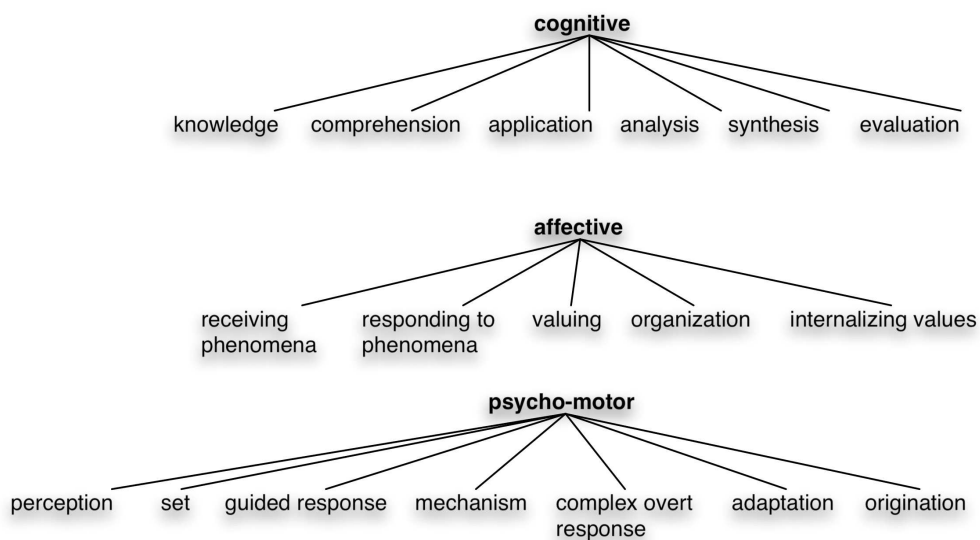


Figure 7.1: Bloom's full taxonomy (based on list given at <http://www.nwlink.com/~donclark/hrd/bloom.html>)

The skills we are most concerned with here are (as described in Dzbor et al., 2005):

Bloom class	Explanation
Knowledge	– i.e. knowledge recall
Comprehension	– i.e. (re-)interpretation of recalled knowledge
Application	– i.e. abstraction and ability to use knowledge in novel context
Analysis	– i.e. formation of inference and reasoning chains with retrieved knowledge
Synthesis	– i.e. creation of new structure from patterns in the existing knowledge
Judgment/evaluation	– i.e. ability to consciously base one's decisions on discovered patterns and to recognise the value of inferred knowledge.

While it may seem that these skills are very abstract, they are at the basis of the kinds of skills which researchers need to acquire. For instance if we look at the set of skills the UK PhD funding councils expect students to acquire we can see the following mappings between Bloom's skills and those included under their first heading.

A) Research Skills and Techniques - to be able to demonstrate:	
• the ability to recognise and validate problems	Analysis, evaluation
• original, independent and critical thinking, and the ability to develop theoretical concepts	Analysis, evaluation, synthesis
• a knowledge of recent advances within one's field and in related areas	Recall, comprehension
• an understanding of relevant research methodologies and techniques and their appropriate application within one's research field	Recall, comprehension, application
• the ability to critically analyse and evaluate one's findings and those of others	Analysis, evaluation
• an ability to summarise, document, report and reflect on progress	Analysis, evaluation, synthesis

Given the pedagogic importance of the acquisition of these skills the questions which can be posed of the REASE repository are of two kinds: a) Does REASE help students in performing tasks which require a particular skill? b) Does REASE help in the acquisition of a particular skill? For example: Does REASE help in recalling knowledge? Does REASE help in the acquisition of the skill of knowledge recall? The latter question can in turn be split into two: Does the infrastructure foster the skill or do the contents of the repository?

In the following discussion we deal mainly with the skill of knowledge recall since this is the main 'skill' which the REASE infrastructure could be said to exhibit. However, it is possible that the infrastructure could foster other skills. For example, the topic index offers a taxonomy of concepts which could help with analysis; an example organization of knowledge might influence learners' cognitive schemes.

While we are not directly concerned with it here, REASE could also be used to foster skills in teaching contexts. For example, students could use REASE to write a synthetic overview of Semantic Web Studies, integrating a range of material and fostering comprehension and analysis as well as synthesis skills. While nothing in the infrastructure would prevent this, nothing would actively assist with it either.

Does REASE provide a focused recall of material and concepts?

Section 4 has shown that (apart from some problems with the interface) REASE does in fact provide ready access to a wide range of material in a timely and contextualized fashion. The search mechanism is reasonably efficient. However, it could be argued that the current topic/index taxonomy is inadequate and to some extent misleading. This is partly the fault of the designers of REASE and partly the fault of material suppliers. The inadequacies in the design may be overcome when we move to a taxonomy based on the REWERSE curriculum. However, this does bring with it the danger that while learners using the REWERSE curriculum will find the new taxonomy easier to navigate, others will find it harder. As we indicate in deliverable D3.3.3, ASPL should overcome these difficulties by (a) a truly contextualized search mechanism which is (b) capable of utilizing multiple alternative ontological frameworks. The effect will be that learners can search the repository using any ontology. With regard to problems arising from the tendency of authors to assert that learning units are instances of several classes, thus making search less focused, our view is that this can best be avoided by providing a suitably rich initial indexing taxonomy. In addition, authors might be reminded that they restrict the audience for their material if they do not make it easier to apply a focused search. Metadata, too, plays a significant role in search. While the current metadata scheme provides for a reasonably efficient retrieval mechanism, it will need to be adapted in the light of future experiences of learner needs.

Does such recall foster the Bloom skill of knowledge recall?

This can only really be tested by evaluating the performance of learners who use REASE. The Bloom taxonomy provides a framework for such an assessment. Prima facie any tool which provides easy, contextualized access to material will help with the acquisition of this skill. However, there is no necessary connection between computer aided recall and individual recall. In fact, it could be argued that using the computer to retrieve material in fact detracts from the acquisition of the skill (just as the use of calculators has been blamed for a decline in arithmetic skills). Of course, it should be borne in mind that the recall in the two instances is different: REASE recalls macro materials, the knowledge recall skill is about the recall of components of these such as concepts, conceptual structures and so on.

Do REASE resources foster the Bloom skill of knowledge recall?

Even if resources were designed to foster this skill, it would require a more extensive process of evaluation to see if they in fact succeed. As we have said already, the evaluation of REASE material in terms of pedagogic goals and success in meeting them may form part of the quality management process (see section 5). In general we can say that very few of the resources contained in REASE include specifically pedagogic components; many are copies of lectures without any explicit pedagogy.

The following table includes possible ways of testing the success of a resource in terms of the fostering of Bloom type skills.

Bloom class	Evaluation	Conclusion	Pedagogic test
Knowledge recall	Does REASE help with the performance of knowledge recall?	Via search, metadata and topic index, REASE provides focused recall of material. Helps learner by providing material to recall/seeing what is recalled etc.	
Knowledge recall	Does REASE help with skill acquisition?	In general, the framework does not in itself help with these tasks (apart from recall). However, the resources contained within the repository should, if they are to act as learning materials, assist learners in acquiring these progressively more abstract skills.	Can the learner recall a significant proportion of important domain concepts?
Comprehension			Can the learner explain domain concepts?
Application			Can the learner apply these concepts in solving new problems?
Analysis			Can the learner show how these concepts are related?
Synthesis			Can the learner put these concepts together in novel structures?
Judgement/evaluation			Can the learner criticize these concepts?

In general our view is that the REASE infrastructure can only actively help in the performing acts of knowledge recall. The skill of knowledge recall and all the other skills can only be fostered by the *contents* of the REASE repository. As we have seen, very few resources actively seek to further pedagogic goals.

In conclusion, in relation to pedagogic requirements, the REASE infrastructure and/or its contents should promote Bloom type skills or at the very least should not inhibit the acquisition of these skills. It is our view that REASE goes some way to foster skill acquisition. It could do better though with the addition of semantic technologies. This analysis of REASE suggests two points:

1. that authors need to be more active in adding pedagogic goals to their material; and
2. that there is a role for a system which can go beyond REASE in fostering Bloom type skills.

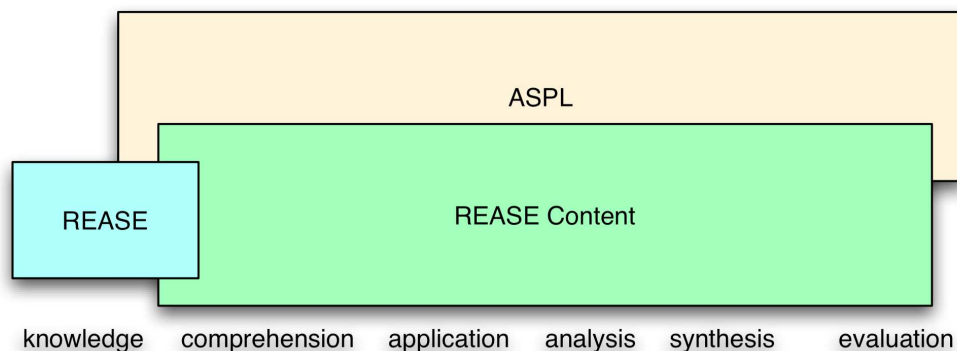


Figure 7.2: How REASE and ASPL satisfy pedagogic requirements

As we can see from Figure 7.2, our view is that the REASE interface can support knowledge/data retrieval, and that REASE content can support the acquisition of learning skills. We also believe that ASPL (REASE + semantic technology) can support skill acquisition. We will report in D3.3.5 on the extent to which this latter claim can be shown.

8 Summary

This deliverable is a report about the many different requirements on the joint infrastructure for providing learning resources about the topic “Semantic Web”. This includes mainly requirements from an accessibility point of view and pedagogical requirements, but further requirements regarding quality management, cross-area / cross-network (REWERSE) usage of the infrastructure are also covered.

9 References

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