E/T-D9

Educational and Industrial Training Infrastructure: A Progress Report

Abstract

This deliverable reports about the validation and use of REASE, the prototype of the educational infrastructure used for both academic and industrial training. It also reports about the improvements made to REASE as a result of the validation and evaluation of REASE and sketches the plans for integration of more courses for both learners from academia and industry. This report is based on joint work between both, the education and training activity and the technology transfer activity of REWERSE as well as with the education area of the NoE KnowledgeWeb.

The deliverable E/T-D9 comprises both, a written report and the prototype as described in this report and available under http://rease.semanticweb.org.

Keyword List

Semantic Web education, Learning unit repository, REASE, cooperation with KnowledgeWeb

Educational and Industrial Training Infrastructure: A Progress Report

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Abstract

This deliverable reports about the validation and use of REASE, the prototype of the educational infrastructure used for both academic and industrial training. It also reports about the improvements made to REASE as a result of the validation and evaluation of REASE and sketches the plans for integration of more courses for both learners from academia and industry. This report is based on joint work between both, the education and training activity and the technology transfer activity of REWERSE as well as with the education area of the NoE KnowledgeWeb.

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Contents

1. Introduction.

This deliverable reports about the evaluation of the first prototype of REASE (Repository of EASE for Learning Units)[1], the educational infrastructure for learning units on Semantic Web topics. The main purpose of REASE is to collect such learning units and make them accessible to the community in one repository. To ensure that the repository can operate also beyond the EU funding for REWERSE, it will be hosted by the **E**uropean **A**ssociation for **S**emantic Web **E**ducation (EASE). EASE has been founded in June 2006 with members from KnowledgeWeb and REWERSE.

This deliverable is the third deliverable from a series of in total four deliverables, starting from E/T-D4, where the design of the infrastructure was described and discussed, and continuing with E-D6 and T-D6, describing the first shared prototype of the infrastructure for education (E-D6) and industrial training (T-D6), which has been constantly improved since the publication of these deliverables. The main purpose of this deliverable is to describe the evaluation of the first prototype and the improvements regarding functionalities and design resulting from the evaluation. The report also sketches the plans for the integration of additional courses for learners from both academia and industry.

This deliverable comprises both, a written report and the prototype as described in this report and available under http://rease.semanticweb.org.

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[1] http://rease.semanticweb.org

2. Evaluation of REASE

Our strategy to evaluate REASE was to follow several paths to look at REASE from as many different perspectives as possible. For this reason, we have done at first a log-file analysis showing that the usage of REASE has significantly increased during the past 12 month, not only in quantity (number of users) but also in quality (number of visits per user). Second, we have sent a short questionnaire to all REASE users as of October 2006 and asked them about their experiences with REASE. Third, we have performed a joint user study involving KnowledgeWeb and REWERSE partners to specifically validate some aspects of the usability of REASE. Finally, we have specifically analysed the REASE catalogue, which has been derived from the Semantic Web Topic Hierarchy[2], to also evaluate this essential component of REASE.

2.1. Usage of REASE

In this section, we report about the usage of REASE and the provided resources. The presented numbers are gathered from log files of the underlying web server as of mid February and from the bookings and access information of the database, on which REASE is based. This is an update of Section 6 in the KnowledgeWeb Deliverable D3.2.5v2.

2.1.1. General Usage of the REASE Web Pages

The usage of the REASE web pages since they went online in July 2004 is shown in the following figure (the statistics were taken on Mar-01 2007 from the web server log file excluding accesses from popular web robots and accesses from within the hosting domain of REASE):
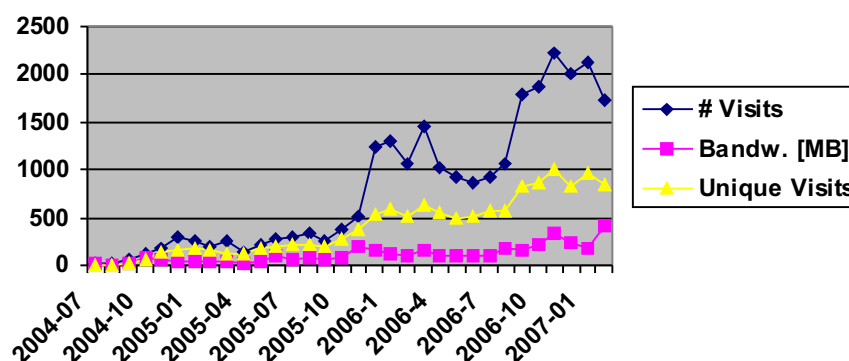
Figure 1. General Usage of REASE web pages

The first public announcement of REASE was issued in October 2004, leading to an initial increase in the access statistics, because a first set of learning resources became available in November 2004. Whereas the number of accesses remained stable in the first half of 2005, it increased again in summer 2005, mainly because of the summer school activities of KnowledgeWeb and REWERSE. Especially, the teachers of the REWERSE summer school were required to upload their material before the summer school starts so that the students could access them from REASE directly. Finally, the usage of the REASE web pages increased again starting from October 2005. As an example, the REASE web pages were visited about 500 times from about 380 unique visitors in November 2005, downloading an approximate amount of 200 MB of data. Even though especially the increase in the number

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[2] http://wiki.ontoworld.org/index.php/Semantic_Web_Topic_Hierarchy

of non-unique visitors was partly caused by evaluation activities in November 2005, the main increase could not be associated with a single or few events. After the addition of several learning resources in the end of 2005, the general usage of REASE increased significantly at the beginning of 2006 with the usual 'break' in the summer. The peak in November 2006 is again partly caused by the evaluation of the platform. More details are discussed in the following sections about registered users and institutions and the actual access patterns of the learning material.

2.1.2. Registrations on REASE

To access most of the material on REASE, users have to register first and specify information about their hosting institution (i.e., university or company and their country). The following figure depicts the number of registered users / institutions on REASE as of March 2007.
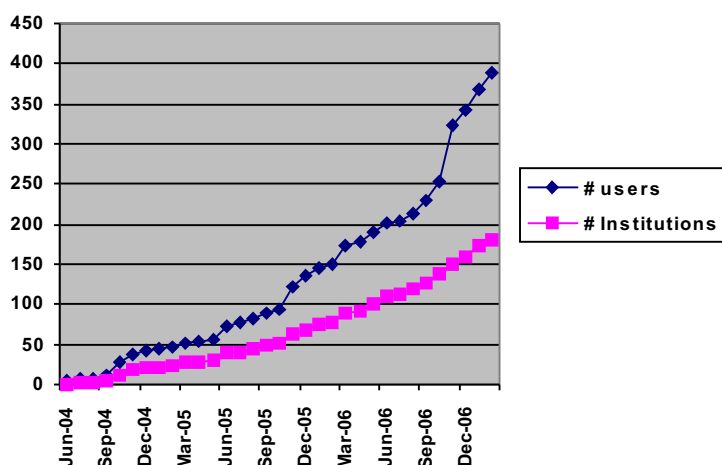
Figure 2. Number of registered users / institutions on REASE

The first public announcement of REASE in October / November 2004 led to the registration of users and institutions from KnowledgeWeb and REWERSE mainly. The second increase in June 2005 is mainly caused by the fact that REASE was used to distribute the learning material for the REWERSE summer school. The increase in November 2005, however, is not dominated by KnowledgeWeb or REWERSE activities, only 2 from the 12 additionally registered institutions were actually directly related to one of these NoEs. In 2006, the increase in the number of registered institutions continued even with a slight increase in the rate of change. The number of registered users also increased and doubled compared with the end of 2005. However, please note that about 50 additionally registered users are due to the user study for the REASE evaluation as performed in November 2006.

Regarding industrial users, we have found that about 20 registered institutions (8% of all) are from a non-academic context.

2.1.3. Access to REASE Resources

REASE resources were accessed as shown in the following figure:
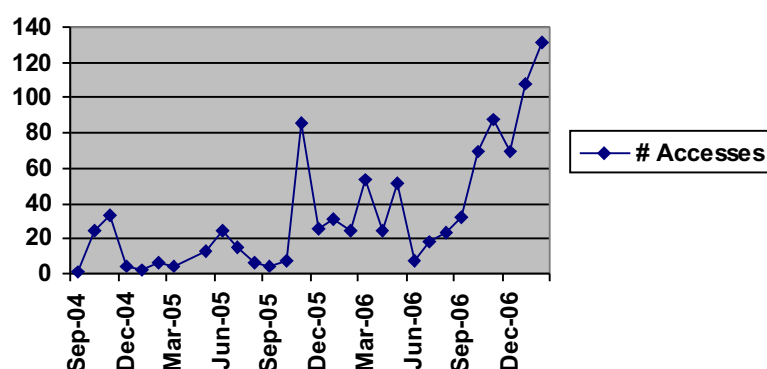
Figure 3. Accesses to REASE resources

The peaks in October and November 2004 were caused by a few users who accessed quite a large set of learning units, obviously playing around with the platform. This included people from KnowledgeWeb or REWERSE, but also one person from outside both NoEs. The peak in July 2005 could be because of the KnowledgeWeb and REWERSE summer schools, which took place at that time. The peak in November 2005 is partly (about 40 from the 85 accesses) caused by evaluation activities. However, 39 accesses were from users all over the world (Malaysia, Germany, USA, France, Brazil, Canada, and Greece), who were definitely not involved in KnowledgeWeb or REWERSE! Accesses continued on a much higher base level in 2006 with the usual 'summer break' in June-August. As in 2005, the peak in November is partly a result of the user study.

2.2. Asking REASE Users: The Questionnaire

In order to evaluate the first prototype of REASE, we have prepared a short questionnaire together with partners from the NoE KnowledgeWeb and have sent it to all 237 registered users of REASE as of October 2006 and received feedback from 68 participants, a 30% return rate.

The questionnaire comprised five blocks of questions:

1. General
2. Usability and Accessibility
3. Finding Information
4. Information quality
5. Providing Information

This reflects the different purposes of the questionnaire, namely to get to know more about the users (1.), evaluate the quality of the material on REASE (4.) and to evaluate the user interface (2., 3., 5.) for both consumers (2.+3.) and resource providers (5. 'providing information').

2.2.1. General information

We were interested to see what type of people were using REASE, partly so that we could better analyse the results, and partly because we were just interested to see which kind of person REASE appeals to or may be useful for. So we asked some general questions about the users:

1. **How many times (roughly) have you visited REASE up to now?**
2. **What is/was your primary purpose for visiting REASE?**
3. **How did you hear about REASE?**

4. **How likely are you to return to REASE in the future?**

5. **Which term best suits your primary job status?**

In response to question 1, most users had visited REASE between 1 and 5 times (31 out of 68, or 45.6%), with 18 users having visited between 5 and 10 times, 13 users having visited between 10 and 50 times, and for 6 users it was their first time. There were no real "power-users" who had visited more than 50 times (not that we expected there to be, but it was worth asking just in case). As time goes on, we expect the number of repeat visits to increase: it is encouraging at least that so few people had only visited once.

The majority of people visited REASE to find specific material (39 out of 92 responses, i.e. 42.4%), while the next highest reason was for general browsing (31). 17 people visited REASE to upload material, while the remaining 5 people gave their reason as "other".

The response to Question 3 shows that majority of the users learned about REASE through KW or REWERSE (32 out of 71, i.e. 45.1%). This is not surprising since the members of these networks were explicitly encouraged to register. 15 people came across it via a search engine, which is very encouraging, while 11 people heard about it from a colleague. Several students indicated that REASE was recommended to them by their professors.

When asked how likely they were to return to REASE again (question 4), 26 out of 66 people thought they would be quite likely (39.4%), while 24 people thought they would be very likely. Thus the combination of people quite or very likely to return was 50 out of 66 people, or 75.8%, which is very encouraging. 14 people also thought they might possibly return, while only 2 people thought it was unlikely, and no one discounted the possibility completely.

Finally in this section, we asked users about their primary job status. The vast majority described themselves as academics (47 out of 63, or 74.6%), while 7 described themselves as students, 6 as industrials, and 3 as "other" (but did not elucidate what this might be). While we expected a high proportion of academics, we expected a higher proportion of students, but it is possible that some PhD students described themselves primarily as academics. It is slightly disappointing that there were not more responses from industry, but perhaps the industrial users of REASE did not have time to answer the questionnaire.

2.2.2. Usability and Accessibility

For each of the following 5 issues, we asked the users to rate the repository in terms of very good, quite good, OK, quite poor, very poor.

6 **Aesthetics**

7 **Layout**

8 **Ease of navigation**

9 **General usability (fonts, colours etc)**

10 **Speed**

All these questions scored reasonable marks, with questions 6, 7, 9 and 10 all rated mainly as "quite good", and none rated at all as "poor". In fact, some of the highest overall scores in the questionnaire were for this section, which is encouraging. We also asked them in question 13 to rate the format of the material (in terms of "yes", "no" or "not sure"):

13 Was the format of the material suitable for your needs?

For question 6 (aesthetics), 37 out of 65 responses (57%) were "quite good", while responses were "very good", 11 were "OK", and only 2 were "quite poor" (just over 3%).

For question 7 (layout), 29 out of 65 responses (44.6%) were "quite good", while 27 responses were "OK", 7 were "very good" and again only 2 were "quite poor". The general consensus from the comments here was that the pages are too cluttered and that much of the information does not need to be there all the time. One comment was that: *"I do not feel*

the homepage to be easily understandable for browsing and obtaining information. I'd rather prefer a typical / standard website structure.". It is not clear, however, what exactly is meant by a "typical/standard website structure". Another comment was that the *"text on left column [is] too narrow and elongated."*. We already tried to address these issues in the improvements made to the user interface at the beginning of November 2006.

Question 8 (ease of navigation) was primarily rated only as "OK". 27 out of 65 responses (41.5%) were "OK", while 20 responses were "quite good". 13 responses were "poor" (20%) and only 5 were "very good". However, this issue may have more to do with the search mechanisms and categorisation (as detailed in questions 11 and 14).

Question 9 (general usability) was also primarily rated as "quite good" (by 33 out of 66 users, i.e. exactly 50%. 25 users rated the speed "OK", while 6 rated it as "very good" and 2 rated it "poor". The only comment in this section was about popup blockers (which many people have installed) preventing the user getting to the actual material unless they were disabled, which is annoying for the user.

We can conclude that the general usability could probably be improved by the attention to some of the other aspects already mentioned, which we already tried to address in the latest user interface version.

Question 10 (speed) was also primarily rated as "quite good" (by 28 out of 66 users, i.e. 42.4%. 23 users rated the speed "OK", while 8 rated it as "very good" and 7 rated it "poor". According to the comments received, the slow speeds seemed to be associated with the downloading of material, which (as one person said) is to be expected when file sizes are very large.

We also asked the users directly (in question 13) if the format of the material was suitable for their needs. The answer to this question was "yes" in 48 out of 59 cases (81.4%), with only 7 negative responses and 4 "unsure" responses.

If we add together the scores for all the questions in this section, the most frequent response, with 147 out of 384 total answers, is "quite good" (score 4). This is summarized in Figure 4.
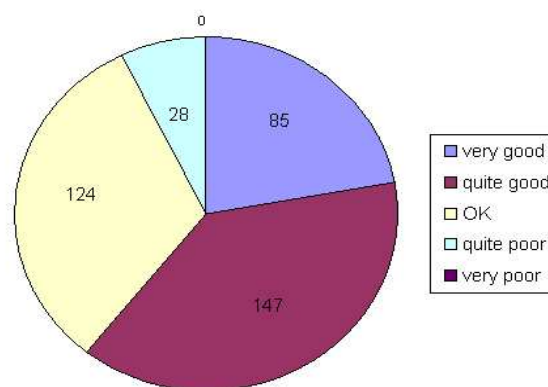
Figure 4. Total scores for usability / accessibility

2.2.3. Finding Information

An important aspect of REASE is how easy it is to actually find the information one is looking for, since the quality of the information, and in fact the existence itself of REASE is irrelevant if the information cannot be found easily. We asked the following questions about finding information:

11. How easy was it to find what you were looking for?

12. Did you find other things of interest that you had not set out to find?

13. How easy was it to use the search mechanism?

Question 11 returned a majority of "quite easy" responses (28 out of 63, i.e. 44.4%). 19 people replied "OK", while 11 people found it "quite hard" to find what they were looking for, and only 5 people found it "very easy". Fortunately no one found it completely impossible. One person commented that there are some resources only available for registered users, but you cannot find this out unless you are already logged in. This has been changed in the latest version of REASE where all resources are visible in the catalogue, and users are informed that they have to login when they actually try to access the learning resource.

The search mechanism, on the other hand, was clearly more of a problem for many people, with the majority of people (21 out of 62), i.e. 33.9%, finding it only "OK", 19 people finding it "quite easy", 11 people finding it "very easy", and 4 people finding it "quite hard". There were several comments which made the problems clearer. For example, some people got errors when performing a search (though it is not clear whether this was through user error or a problem with the system); other people found the hierarchy very unintuitive and difficult to use. It was also suggested that a more sophisticated search was incorporated, such as making suggestions based on a user's past history. We have already modified the catalogue in several ways, for example, adding an expand/collapse mechanism and avoiding that the currently selected topic is always shown on top of the catalogue.

While the responses to these questions are not negative overall, they still show that people cannot find things as easily as they might, and that the search mechanisms could definitely be improved. If we look at the overall scores for questions 11 and 13, we find that they are very similar (216 for question 11 and 213 for question 13), which is on the one hand surprising given that the number of people who replied "quite easy" to question 11 was significantly higher than the number who replied "quite easy" to question 14, but on the other hand unsurprising given that the two issues are strongly related.

If we add together the scores for questions 11, 12 and 14, the most frequent response, with 57 out of 187 total answers, is "OK" (score 4). This is depicted in Figure 5.
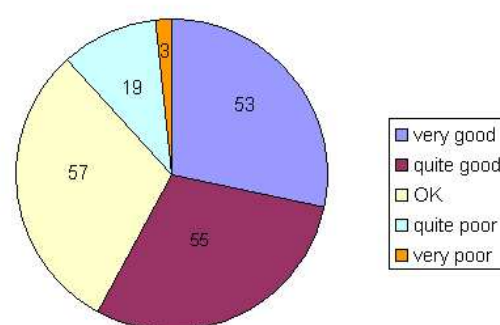
Figure 5. Total scores for information finding questions

We also asked the users about "accidental information discovery" (question 12) as we were interested to know about the browsing potential of the site, where people find things of interest that they were not originally searching for. An example of this is Amazon's "other

people who bought X also bought Y" mechanism (and in fact this was explicitly mentioned in one comment). REASE has a similar mechanism "Users interested in this learning resource were also interested in the following learning resources:" which appears when a user looks at the page containing specific information about a certain resource. The answers to question 12 showed that a high proportion of users did indeed benefit from accidental discovery, with 37 out of 62 users answering "yes" to the question (59.7%), 8 users replying "no", and 17 users unsure (perhaps because they were not sure if the material they found accidentally was useful, or because they were not sure if they had found the material accidentally).

2.2.4. Information Quality

We also wanted to know how users perceived the quality of the information they found on REASE. Question 15 addresses this issue.

15. How would you rate the quality of the material you found?

The majority of answers to this question were "quite good" (27 out of 60, i.e. just under half the total answers), with 15 responses of "OK", 14 of "very good" and only 4 as "not as good as I would have liked". No one thought the quality was very poor. There were many comments about this topic, ranging from very enthusiastic to suggestions for improvement. A very useful comment was that *"perhaps more needs to be done to make it clear that this is an educational database which has material NOT in other databases such as ACM Digital"*, which is indeed a very valid point.

2.2.5. Providing Information

Another important aspect of REASE is specific to the provision of information. If the system is not conducive to users providing material with minimal effort and time, then they simply will not do so since there is little benefit to themselves apart from the wider dissemination of their work (and they will therefore find other methods of dissemination). Much of the questionnaire relates to both uptakers and providers of material, but we devote a small part specifically to the issue of information provision.

16. How easy was the general process of uploading your material (from start to finish)?

17. When approximately was the last time you uploaded material?

18. How easy was it to use the classification system?

19. Would you recommend the site to other providers of material about Semantic Web topics?

The responses showed that while information providers would, on the whole, recommend the site to others, they found the process of uploading information quite tedious. 11 out of 29 users (40%) found the general process OK, with 9 users finding it quite easy, 7 finding it quite hard, 1 finding it very easy, and 1 finding it impossible. The main comments were that the process took too long and there was too much information to be filled in; several people reported that they had spent time filling in the information only for the system to fail and that they had to repeat the information filling process from the beginning (this bug has been found after a long chase…). Clearly there is a difficult trade-off here, with information providers wanting to provide less information about their resources, but information seekers wanting more information about resources to be available.

Question 17 is another non-judgemental question which looks at information provider behaviour and provides some background information. The most frequent answer to "when did you last upload material?" was "less than 2 months ago" (8 users out of 29, i.e. 27.6%), with 6 for "more than 6 months ago", 6 for "more than a year ago", 5 for "more than 2 months ago" and 4 who couldn't remember. This shows a fairly even split across the board, and we cannot deduce much from this answer since it is more likely that people responding to the questionnaire will have uploaded information more recently.

Question 18 looks at the classification system from the point of view of an information provider. In contrast with an information seeker (who can get lucky by using the general search facility if she is not sure in which category she should look), an information provider needs to understand the classification system quite clearly in order to decide where to place his material. Most users found the classification system OK (15 out of 28 users, i.e. 53.6%), while 8 found it quite easy, 4 quite hard, 1 very easy, and no one found it impossible. The comments showed that people found it harder to classify their material at first, when there was little material already in the repository that they could use as an example, but easier the more material was present. A few people did not find it very intuitive. We have adopted a more popular tree-like view of the topic hierarchy in the latest version of REASE to make the classification process of uploaded material easier.

The most encouraging thing about this section was that while they may not have been completely satisfied with the process of adding resources to the repository, most information providers would still recommend the site to other users (question 20), and in fact, some commented that they have already done so. 12 out of 20 users said they would be very likely to recommend the site to others (60%), the same number said they would be quite likely, while 5 said they would possibly recommend it, and no one said they would be unlikely to recommend it or would never recommend it, which is good news.

If we combine the scores for questions 17, 19 and 20 (we ignore here question 18 since it is non-judgemental), the most frequent response, with 31 out of 86 total answers, is "OK" (score 4). This is depicted in Figure 6.
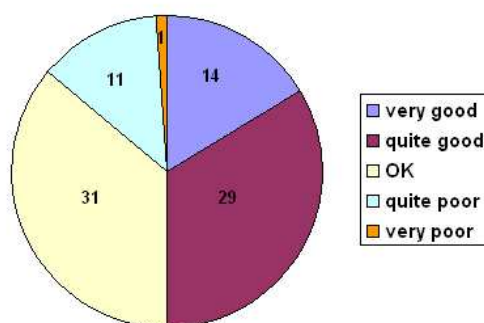
Figure 6. Total scores for information providing questions

2.2.6. Discussion and Improvements

Clearly the questionnaire has been very useful, not only in establishing the validity of the repository and highlighting much user satisfaction, but also in highlighting areas which need attention and suggesting new features and improvements to the existing repository, mechanisms, and materials contained within it.

More details about the evaluation of the results from the questionnaire are available in the KnowledgeWeb deliverable D3.2.5v2[3] as this deliverable is focusing on the actual implementation of the changes in the REASE prototype.

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http://knowledgeweb.semanticweb.org/semanticportal/home.jsp?_origin=%2Fhome.jsp&_sew_instance_set=kweb&content=instance.jsp&_sew_instance=D3.1.5v2%3A+Published+Learning+Resources+and+Evaluation+of+REASE&_sew_var_name=instance

2.3. Conducting the User Study

After having included most of the comments resulting from the analysis of the questionnaire, we conducted a user study subsequently at four institutions, one from REWERSE (L3S) and three from KnowledgeWeb. The main idea was to get feedback from users who are at the moment working with REASE instead of asking them weeks or month after they have used REASE the last time (some REASE users obviously could not remember having registered before as they answered 'my first visit to REASE' in the questionnaire). Such users were supposed to report more problems with the user interface directly when they experienced the problems, even though we were aware that they don't have an intrinsic motivation to use REASE (they were 'kindly asked') and might issue much more criticism as in the questionnaire.

The user study comprised a series of four short and fairly simple tasks that involved using REASE and that should take no more than 45 minutes. The task had to be carried out by the users on their own with only one contact person to resolve any problems. For the study, only two windows of a web browser were required, one for interacting with REASE, and one describing the task in the html page, which was also used to record the results of this study and to include general comments.

This deliverable summarizes the main results of the user study which led to changes in the REASE prototype as described later. A detailed description of the user study can be found in the KnowledgeWeb deliverable D3.2.5v2.

2.3.1. General Results

At first, the user study ran into several general problems:

- None of the participants had ever used REASE before and the time reserved in the study to get used to it was found to be too short. This was especially true concerning the navigational characteristics of the REASE platform: REASE can become confused rather easily and go to an inconsistent state requiring restarting from the main page if users make extensive use of their browser's back and forward buttons. For this purpose, only very few users could actually rate the content of the discovered resources (the last task of the user study).

- The study at L3S suffered from the fact that all users were connected using one WirelessLAN access point, which made the server seem to be very slow (because of the download of many MB of material within a short time frame). Furthermore, the platform crashed in the middle of the study because of a too small java memory heap parameter value (this problem never occurred before because never before were 15 users simultaneously accessing REASE). This error was fixed immediately afterwards, so that the subsequently conducted study did not suffer from this problem.

- The interface to provide feedback did not work with Internet Explorer 7.0 (for some reason, the results were not stored in the database after people pushed the 'submit' button). Hence, some participants could not submit their results.

2.3.2. The Scenarios

After spending 5 minutes to get familiar with REASE, the participants had to use REASE in four different straightforward scenarios. The first one was intended to use the keyword search for finding material about the topic 'Problem solving methods'. The second was intended to use the REASE catalogue to find material about the topic 'Human language technologies'. In the third scenario, users were asked to use the 'advanced search' facilities of REASE in combination with the catalogue to find resources about 'Description Logics'. In the fourth and final scenario, the participants should use their favourite search strategy to find material about 'OWL'.

In the first scenario (using plain keyword search), more than 90% of the users actually found the two resources we considered to be relevant, which underlines the effectiveness of the keyword search mechanism (one user obviously used the Google search box located close to the REASE search box and returned URLs of general web pages, not from REASE resources). A detailed analysis of the used keywords revealed that the users played around with the keywords to look for additional resources to be sure that they found all relevant resources (we provided four empty text boxes for additional results which made many participants feel that they should find four resources). On average, the participants posed 2.4 queries in the first scenario and already used advanced search (even though they were supposed not to use it in this scenario).

In the second scenario (browsing the catalogue), again more than 90% of the participants found the single resource we considered most relevant here. However, most of them were still using the plain keyword search mechanism, only about 10% were actually directly selecting the catalogue category in which the most relevant resource is located. 20% of the participants used keyword search (perhaps they were used to it; actually they could find the resource in this way, too); the rest intelligently used other filtering mechanisms while browsing the catalogue (which was not intended by the study designers). Again the participants tried to explore the available resources in different ways to be sure that they found all relevant ones, using combinations of different search keywords, filtering keywords and catalogue classifiers.

In the third scenario (using advanced search) actually >90% of the participants used the advanced search, of which 80% used the option to search in specific categories (as intended by the designers of the study). 65% of the participants selected the relevant categories from the catalogue, which is an indicator that the REASE catalogue is designed reasonably. In general, on 25% of all advanced search queries (beyond the user study) involve the category classifiers.

In the fourth and final scenario (using any of the above mechanisms), 60% of the users preferred advanced search,10% used direct browsing the catalogue. The remainder again browsed the catalogue with different filters or simply navigated through the whole set of resources as you can get from a resource to its categories and subsequently to other resources within that category.

The main result of the user study was, hence, that the vast majority of the participants could successfully complete the scenarios (quite some running out of time), even though they used different and often unexpected ways to achieve the goal, which makes the formal analysis of the results of the user study rather difficult. However, we also provided the users with the ability to provide us with free-text comments while they were doing the study. These free-text comments actually were the most valuable outcome from the study as they suggested quite some improvements that we finally included in the current version of the prototype. Below is a list of the most interesting free-text comments:

2.3.3. Specific comments:

- The 'back-button' problem: Many participants complained about non-deterministic query results, which obviously resulted from using the browser's 'back' button. This confuses REASE and can lead to all kinds of problems. ➔ this is a general problem of web application programming; we could not fix this yet and we are not sure whether this can be fixed at all.

- "it's REALLY annoying that result lists use (sometimes) java script for linking instead of plain links- my usual tabbed browsing behavior doesn't work that way. I really hate it when systems do that" ➔This was introduced by intention as using several instances of REASE within a browser can also confuse a session-based web application such as REASE.

- One user suggested to limit the search results and cut off the very irrelevant items.→ the problem is what is 'irrelevant' here. We think it's better to provide irrelevant results and let the user navigate towards more relevant results rather than showing an empty result set. An improvement might be to use semantic query relaxation but this require major changes in the platform.

- Deselecting 'educational activities' and 'educational events' doesn't work → one of both has to be selected; this has been fixed in the current prototype

- The 'search in result' filter are not correctly reset after a new query (neither in the keywords search result page nor in the browse catalogue page) → This has been fixed

- 'OR' is not available for querying → this is supported by the underlying Lucene search engine, an explanation of the search parameters has been added

- Searching for keywords should also return matching categories → we will add a separate 'search catalogue categories' or provide a list of matched categories as search results

- The list of language in the language selection dialogue in 'advanced search' is too large → this has been restricted to the languages actually available in REASE

- "Difficult to find that 'booking' actually means 'download'" → the name of the label has been changed

- "No Register Button, login->apply is unintuitive"→ fixed while restructuring the main page

- "when using search, it would be nice when the full filters would be displayed on top of the result list (like in the category thingy)" → this is available using the advanced search interface

- "pop-ups are stupid"→ the latest version does not require to disable a popup blocker (but requires an additional click to get to the resource)

2.3.4. General final comments:

- "It's not a very friendly system. It's not easy to find what you want."

- "We think it is a good way to centralized information and help people learn about knowledge science."

- "Its a nice way of collecting the material in a central repository..."

- "Idea is good. User needs quite some familiarity to use the system. Lots of options, but User Interface should be improved."

- "For one file it was hard to retrieve the entire URL.; Very very distracting site; Too much information, too many ways to retrieve it. Just catalogue + search are enough; A nightmare to navigate it."

→ we have simplified the user interface to make it more similar to existing search engine entry pages

- "Generally, the functionality of the tool are counter-intuitive. E.g. Searching and browsing without filters should give the same results, but which is not the case."→ this is because basic search operates on all metadata fields while searching the result list in the 'browse catalogue' page only operates on the corresponding metadata field (e.g., title). A note about this has been added to the search results.

- "Also, I later realised that the actual text of the resources seam not to be indexed, so the search is less effective."→ we are already looking into this; however indexing Powerpoint / PDF can become very difficult and should remain an option (as the quality of metadata is typically much higher).

2.4. Validating the REASE Catalogue: The Semantic Web Topic Hierarchy

Finally, we took a look at the REASE catalogue, which has been derived from the Semantic Web Topic Hierarchy, to show its validity in our context. However, validating topic hierarchies is a difficult business because of its subjective nature. Hence, we adopted the following strategy:

During the creation of the topic hierarchy we started from existing hierarchies (the ACM curriculum) as described in E-D7, and from existing manually selected topics such as then session names of Semantic Web conferences. Furthermore we tried to involve only renown experts in the field, as represented by the partners of the NoEs REWERSE and KnowledgeWeb.

For the maintenance and validation of the Semantic Web Topic Hierarchy, we adopted two strategies: At first, we asked another expert in ontology development, who has not yet been involved into the design of the Topic hierarchy, to do a manual evaluation. As a result, we re-organized some categories and deleted and resolved some duplicated categories.

Second, we tried to make use of external sources to check whether the topic hierarchy covers all existing topics. For this purpose, we compared it with the most popular author keywords attached to publications at Semantic Web conferences.

ontology	95	Matchmaking	7
web services	39	Personalization	6
RDF	34	Ontology mapping	6
OWL	19	Information integration	6
XML	18	DAML+OIL	6
metadata	16	e-Learning	6
knowledge representation	12	Semantic Web Services	6
information retrieval	11	Interoperability	6
knowledge management	11	machine learning	6
Agents	10	OWL-S	5
Description Logics	10	User interface	5
annotation	9	Web service composition	5
P2P	8	RDFS	5
Semantic annotation	8	Rules	5
Information extraction	8	Automated reasoning	5
Search	7	multimedia	5
DAML	7	e-commerce	5

As a result, we found that the topics 'IR / search' and 'machine learning' are not yet available in the topic hierarchy and should be added.

We furthermore compared the topic hierarchy to automatically generated ones, based on the author keywords associated with Semantic Web publications. While the automatically generated graphs are a lot smaller than the manually crafted Semantic Web Topic Hierarchy, we could confirm some relations in the topic hierarchy and at least did not find counter-examples. We also found that the topic 'document classification' is very closely related with

Semantic Web topic and should be added to the topic hierarchy. More details are again available in the KnowledgeWeb deliverable D3.1.5v2.

The current state of the discussion is kept in the Semantic Wiki at

http://wiki.ontoworld.org/index.php/Semantic_Web_Topic_Hierarchy_v2

3. The Second Prototype of REASE

Improving REASE has been done in two major steps: At first, we considered the results from the analysis of the questionnaires to make them already available in time for the user study. As the comments in general were rather encouraging, we focused on incremental changes in the user interface and added missing functionalities. Second, we analysed the results of the user study and decided to radically change the main page layout for simplicity reasons.

3.1. Changes as Response to the Outcome of the Questionnaire

As feedback regarding the layout of the user interface was basically ok regarding the suggestions of REASE users in the questionnaire, we changed the user interface only little (only few users actually suggested as free-text comment for question 7 to do a radical change which we did not implement at this point in time as we felt that a too radical change of the user interface would confuse users being used to the existing user interface). The main change in design, hence, was to re-organize the menu to allow users to reach popular pages with fewer clicks. We also integrated a very short introduction to REASE on the main page about the different possibilities to use REASE: Search, advanced search and browse.

The functionality of the REASE catalogue was criticized much more heavily, especially the unintuitive ordering of selected categories (which were always shown on top), the impossibility to look at the catalogue as a whole, and the 'hidden' information of resources which are not shown because the user is not logged in. This was the main focus of the changes made to REASE directly after having analysed the questionnaire. As a result, selected categories in the catalogue now stay at the same position within the catalogue as non-selected ones (the original feature is useful for catalogues with many top-level categories, which does not hold for the REASE catalogue in particular). Furthermore, there are two additional buttons 'expand' and 'collapse' which allow to take a look at the catalogue as a whole. Additionally, the second prototype of REASE never hides any resources (even if a user is not logged in) and rather requests the user to log in when she wants to view that resource. Finally, the numbers shown after each category in the catalogue adapt in a way such that they show the currently available resources in accordance with the current filter selection. For example, if the filter for the resource type is set to 'recorded lectures', the numbers in the catalogue indicate in which categories resources of this type actually exist.

The second major change apart from the catalogue visualization was the introduction of a classifier 'industrial resource / academic resource' for each of the resources in REASE. In the first prototype of REASE we used the 'outreach to industry' category to tag resources as 'suited for industrial education'. However, this did not allow an orthogonal search, for example, for all industrial resources about 'knowledge representation and reasoning'. Therefore, we added one filter 'target audience' to the 'Browse catalogue' dialogue.

Figure 7. The filter element within the 'browse catalogue' dialog

Finally, we addressed three additional minor comments:

- Enable REASE users to login with their email address (in case the email address is unique).
- Better selection mechanism to classify new resources according to the categories in the REASE catalogue.
- Simplified access to resources (combined 'accept licence + download' button instead of separate page for explicitly accepting the license.

The problem about popup windows mentioned in question 9 was examined but could not be solved before the user study started. In the current version of REASE, however, a user can alternatively click on a separate link to open the popup window explicitly.

3.2. Changes as Response to the User Study

The current prototype of REASE was changed as described in the following sections, describing the design of the main entry page, additional features, and further improvements.

3.2.1. The New Main Page

Resulting from the free-text comments of the participants of the user study and also to address other comments we have received earlier, we finally decided to radically redesign the user interface of REASE, in particular the main page, which has been criticized a lot by the participants (many of the other REASE users, providing feedback in the questionnaire might have used search engines to find resource and came directly to the resource description page bypassing the main page of REASE).

In particular, we changed the main design from the one shown in the following figure
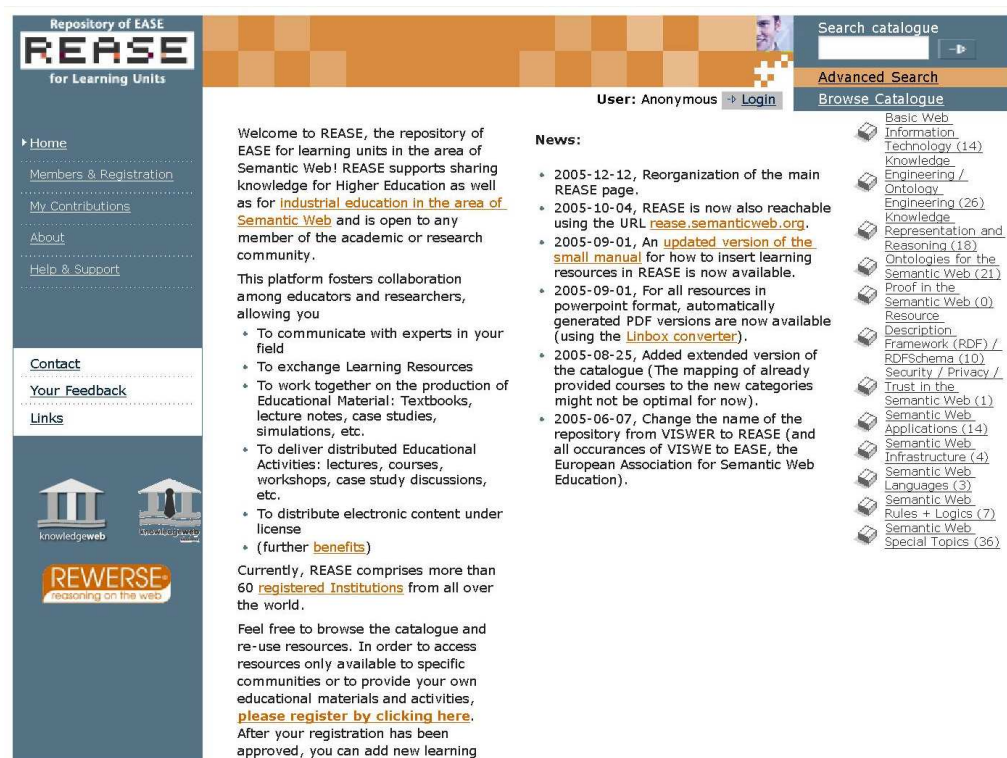
Figure 8. The REASE main page before the re-design

to the one shown in the next figure.
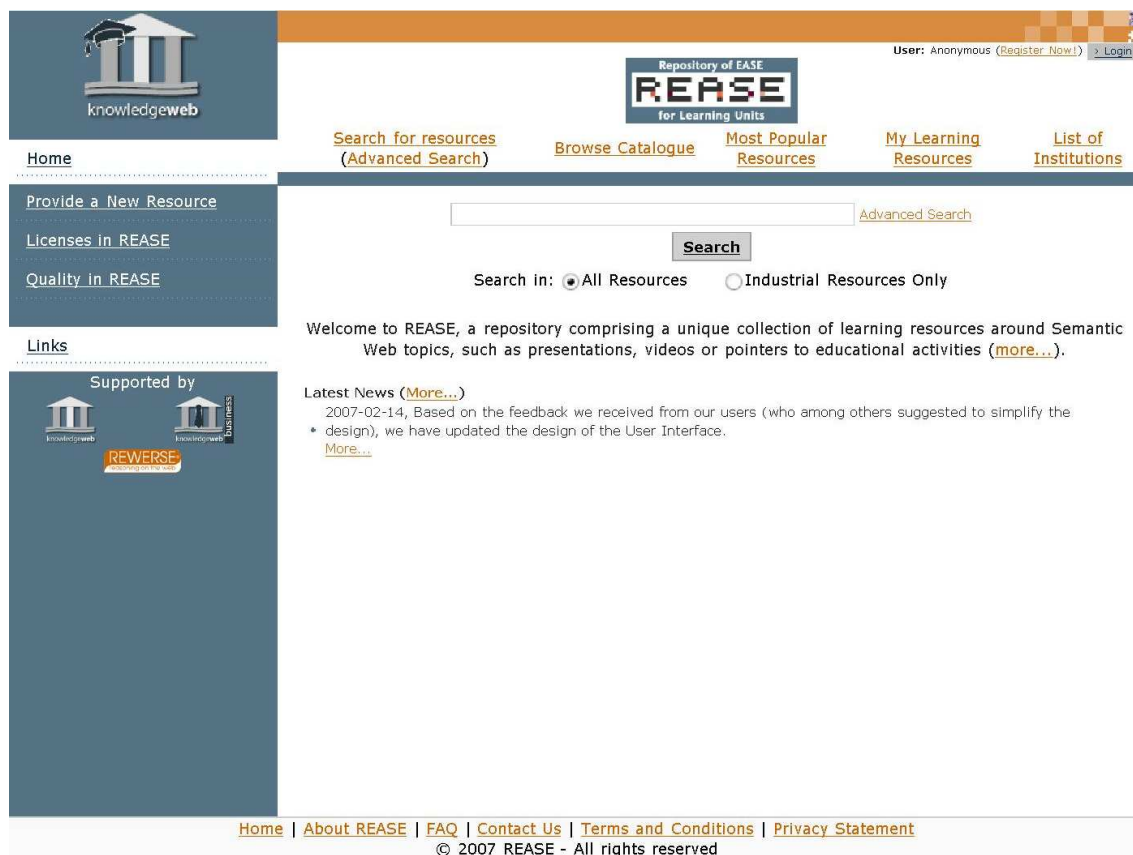
Figure 9. The current main page of REASE after the re-design

The main objects of the new page layout are simplicity, adherence to known layouts, and compatibility with different browsers and screen resolutions.

To implement simplicity, we have removed all information not needed at the first place. For example, we have moved the introduction to a separate page and left only a single introductory sentence in the middle of the screen. Additionally, we have removed all duplicate occurrences of links (for example, those that were available in the footer and the menu). This left only four links in the main menu plus the menu entry 'quality in REASE' which we added just recently to document the quality management process associated with publishing resources in REASE.

The central element of the new simplified design is the search element as most users are using the keyword search and browse the catalogue only rarely. This search element is complemented by the advanced search button right to it and the final 'search' button below it. Additionally, we have included the most important links above the search element in form of tabulators. This points to the advanced search, browsing the catalogue, browsing the list of most popular resource, looking at the resource provided by a user ("My Learning Resources"), and showing the list of institutions registered with REASE. This layout is similar to the popular search engine Google, hence, REASE users should immediately be familiar with the user interface.

To accommodate for the interests of users from industrial environments, we have provided a filter below the search element to only search in industrial resources vs. search in all resources. This filter is also available in the advanced search dialog and the browse catalogue dialog (as shown above).

We have tested the layout with Firefox 1.5, 2.0, Opera 9, and Internet Explorer 6 with different screen resolutions raging from 1024x768 to 1400x1050 and have additionally used different zoom levels in opera and Firefox to validate the design. We also changed the

images to be resized dynamically depending on the zoom level, which increases the accessibility of REASE.

3.2.2. Additional Features

Furthermore, the current REASE prototype has a couple of add-ons, which were also motivated by the comments from the user study:

- More help texts
    - o We updated the manual for how to insert learning resources (cf. E-D4) and integrated it as a help text instead of a stand-alone web page
    - o We added a help text explaining the link of the catalogue to the Semantic Web Topic Hierarchy and describing briefly the motivation of it
- Additional page describing the licenses available in REASE.
- Additional page describing the quality management in REASE.
- Extension of the use cases in which REASE has been used (e.g., for dissemination of the ReasoningWeb summer school material)
- No need to disable popup blockers (separate button to open the window available)

3.2.3. Further Changes

We also changed a number of labels, which were not properly labelled (e.g., the 'booking' button is now called 'access' and the 'search' filter in the browse catalogue dialog, which is now called 'filter'). We have also made several of the main pages more dynamic in the layout, e.g. we don't show visual elements to jump to further pages if the results fit into a single page. Finally, we fixed a couple of bugs which occurred during the user study, such as the too small memory heap size, missing resets of filters after searching for a new keyword, disabling browser caching, and redirecting all requests for the old URL of REASE to the new one (which triggered a nasty bug when providers of information were using both URLs one after the other).

4. REASE for Industry

In this section we summarize the measures taken to make REASE more interesting for the industrial audience.

The first and foremost important change was the introduction of the new classification 'suited for industrial education', which was attached to all resources on REASE. This allows to use special filters for industrial resources during search but also to browse a catalogue with only industrial material in it.

Figure 11. The 'browse catalogue' dialog for industrial users

Of course, such filters are only reasonable if sufficiently many resources are available for industrial education. This situation has improved a lot during the past 12 month with now in total 46 resources being available for industrial education, of which 12 describe course offerings by the Semantic Web School Austria (who provide information about their whole program in REASE). Hence, adding information about face-to-face courses of the Semantic Web School (cf. chapter 2.4.2 of deliverable T-D6) did not require to change the classification for adding this new category of face-to-face courses. The next step would be to contact additional course providers such as the Semantic Web Academy in Karlsruhe to provide their material and links in REASE. Furthermore, it is aimed at including demos which have been produced within the REWERSE network and which are suitable for professionals. An important factor for the suitability of the demos lies also in their educational value.

Additionally, the industrial material also has found quite some interest among the REASE users. Industrial resources are on place 2, 9, and 11 among the most popular resources in REASE.

Furthermore, having information about licenses (as summarized in a separate menu page 'Licenses in REASE') is important for those users from industry who want to reuse the material in their own environment. Knowing about quality management (as summarized in a

separate menu page 'Quality in REASE') and how it is applied is also useful to be sure that the resources on REASE does indeed contain relevant and high-quality materials.

Finally, REASE features also a collection of links to professional providers of SW training in the 'links' section in the left menu. This allows to find more material and professional teachers of Semantic Web related courses in case the interest in Semantic Web Education goes beyond self-study material, which is currently the main focus of the material in REASE.

The next step would be to contact additional course providers such as the Semantic Web Academy in Karlsruhe to provide their material and links in REASE. It has been abandoned to add additionally a list of standardization organizations as suggested in T-D6 because the focus of REASE is on providing educational material. It has been decided to stay in that focus and not to broaden the scope of REASE into other directions. The same applies for the general list of Semantic Web institutions (such as European Networks) which had not being included in the link list of REASE either.

Another suggestion which has been described in T-D6 includes the listing of books and publications suitable for professionals and practitioners. To distinguish such a list from what can generally be found on the web, it would be necessary to provide specific comments suitable for professionals for each publication. Such a list would require reasonable effort and therefore it is necessary to discuss whether it is feasible to provide such a list. The goal is in the end is to provide something usable for professionals using REASE.

As a last aspect to mention regarding REASE for industry are marketing measures (reference T-D6, chapter 3.3.2).From the measures suggested in the chapter mentioned it has been considered most useful to produce a special flyer for promoting REASE. The flyer then can be distributed at events organized by REWERSE (TTA), workshops etc. The flyer would assume the size of a postcard for easier distribution and would be produced until the end of April 2007.

To increase chances that the REASE material relevant for professionals are ranked high in Google, several measures are currently under discussion. One first step is to link the REASE website from the Semantic Web Days website (www.semantic-web-days.net).

5. Future Plans for Integrating Courses

In total, there are 105 learning units available in REASE, from which REWERSE has contributed 42. 4 of these modules are in French, 6 modules in German, the remaining ones are in English. As courses for industrial education were identified to be highly important, we focused on publishing such material in the past month, as shown in the following figure:
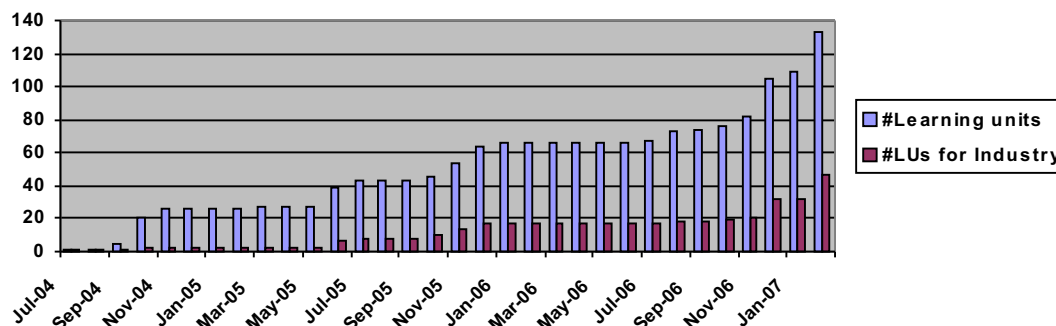
Figure 10. Available learning resources on REASE for all / industrial users

Thus, the percentage of courses suited for industrial education has grown from less than 10% at the beginning of 2005 and 25% at the end of 2005 to 30% at the end of 2006 and 35% in February 2007. From the 27 learning resources added by REWERSE partners during the past 12 month, 14 were marked as suited for industrial education. This included especially the course offers of the Semantic Web School Austria, who have added their catalogue for 2007 to REASE.

Furthermore, REWERSE resources cover 10 categories from the REASE catalogue, which are not covered by KnowledgeWeb units. This underlines that there is not much overlap between the REWERSE material and the KnowledgeWeb material and that they complement each other very well (give the more specific topic of REWERSE compared to KnowledgeWeb, it is evident that KnowledgeWeb resources cover more topics that REWERSE resources).

In 2007, it is planned to again add the material from the Reasoning Web summer school as in previous years. This includes the following courses:

- Reasoning in Description Logics: Basics, Extensions, Tools, and Usage (Ulrike Sattler)

- Foundations of Rule-Based Query Answering (François Bry, Norbert Eisinger, Thomas Eiter, Tim Furche, Georg Gottlob, Clemens Ley, Benedikt Linse, Reinhard Pichler, Fang Wei)

- Reactive Rules on the Web (Bruno Berstel, Philippe Bonnard, François Bry, Michael Eckert, Paula-Lavinia Patrânjan)

- Rule Interchange on the Web (Paula-Lavinia Patrânjan, Axel Polleres)

- Rule-Based Policy Representation and Reasoning for the Semantic Web (Piero A. Bonatti, Daniel Olmedilla)

- Semantic Web Reasoning in Business Intelligence Applications (Kalina Bontcheva, Paul Buitelaar, Thierry Declerck, Paolo Giudici, Martin Hepp, Monika Jungemann-Dorner, Hans-Ulrich Krieger, Paolo Lombardi, Horacio Saggion, Marcus Spies, Alessandro Tommasi, Franco Turini)

- Semantic Web Reasoning in Semantic Wikis (Sebastian Schaffert, Markus Krötzsch, Denny Vrandecic)

As the preparations for a summer school 2008 in Venice have also started already, we expect the material from the courses taught there to be included in REASE, too.

Furthermore, it is expected to get some material for industrial education as outcome from the major industry event in 2007, the Semantic Web Days 2007.

6. Summary and Outlook

In this deliverable we have reported about the current status of the REASE prototype, which is based on the evaluation of the first prototype, jointly done between the education and training activity and the technology transfer activity of REWERSE and the education area in KnowledgeWeb. While the evaluation confirmed in general the usefulness of REASE, it also uncovered quite some areas for improvement, which we already have started to include into the running prototype.

For future work, we plan to integrate the new version of the Semantic Web Topic Hierarchy, which is currently under discussion. Furthermore, we are examining the possibilities to include a full text search for those documents, which can be accessed using the underlying Lucene architecture. Furthermore, the participants of the user study proposed to add catalogue categories to keyword search results and to include 'true' Semantic search along the topic hierarchy to avoid empty results sets.