



Language Technologies for Lifelong Learning



# Language Technologies for Lifelong Learning

LTfLL Overview Service Descriptions

#### 4.1 – The LTfLL Learner Positioning Service

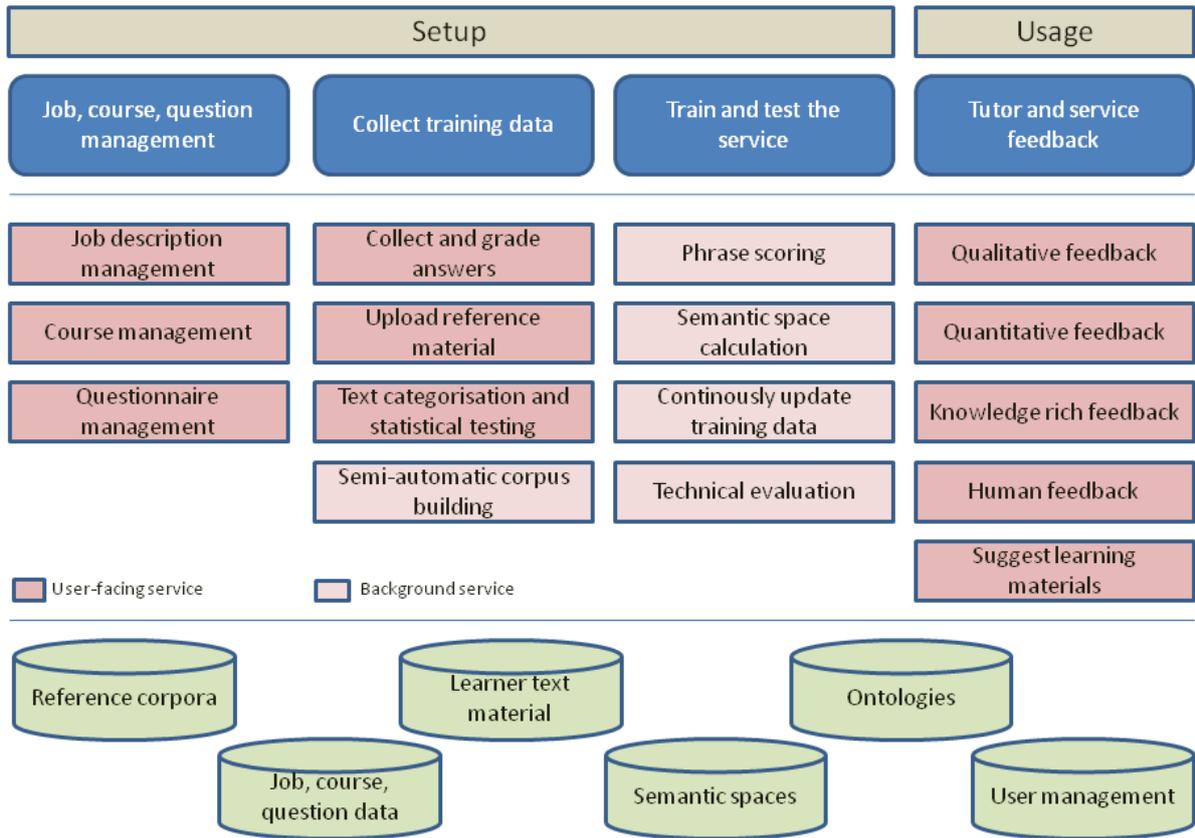
**Problem:** Educational institutions are starting to widen their offerings to a large number of lifelong learners. Traditionally, assessments to position learners use essay writing, questionnaires, multiple choice tests, or simple oral examination. Due to an increased diversity in learners' educational backgrounds, education providers have started to use online learner interactions as part of a wider portfolio analysis to assess the learner position and to enable personalised learning. The growth in the number of registrations and more complex positioning threaten to increase the workload of tutors to unmanageable levels.

**Solution:** The LTfLL positioning services perform a qualitative and a quantitative analysis of learner texts (= 'knowledge poor approach'). Qualitative analysis involves the scoring of phrases extracted from learner texts according to distinctive features of their usage by comparing its frequency in high and low quality texts as graded by experts. The output of this analysis is based on the learner's written phrases and not simply on word frequency. Users can inspect the scored phrases visually. Quantitative analysis uses information such as occurrence counts of these phrases to compute a measure of fit of the learner language as compared to the relevant CoP. Users of the positioning service should interpret the qualitative and quantitative results to assess the learner's position and to decide what course units the learner needs to study, and where additional support might be needed. The services need fine tuning for each CoP by training them on representative texts (e.g. textbooks, highly graded peer texts, etc.). This builds up into a 'reference corpus' which is used to infer the set of relevant concepts. To help experts in building that corpus, the service statistically analyses instructional text materials and suggests which of those should be added to the corpus. Corpus texts then are classified by area of expertise and grading. With these texts the quantitative output for each learner text is generated by measuring the distance between a text and all texts of the 'reference corpus' in two vector space models, i.e. bag of words and bag of phrases. In addition to the 'knowledge poor approach', conceptual coverage of learner texts is computed using an ontology by counting how many associated concepts are found in the learner texts (= 'knowledge rich approach'). As output the percentage of covered relevant concepts will be presented. The analysis of conceptual coverage of learner texts involves the use of an ontology and lexicalisations of concepts belonging to that ontology (e.g. phrases extracted by means of the qualitative analysis) to count how many relevant concepts are found in the learner texts. Finally, after examining the service output, users can examine the appropriate list of instructional texts from the reference corpus. Tutors can use results to decide which materials need to be studied by the learner, and in which area of conceptual knowledge the learner may require further support. Learners can evaluate their own position and identify their strengths and weaknesses.

**Story:** *Sylvia attends a four to six hour introduction workshop to help her develop her learning path. During the workshop she uses the positioning service web interface to answer the questions regarding the course she will take and provides additional text material (her CV, job description etc). This material is uploaded by the tutor. The service generates an output, which grades Sylvia's knowledge for each unit of the course in the scale 1 to 3(1 is best). Sylvia and her tutor are using the results of the positioning service as the baseline for creating Sylvia's learning path and the required learning methods for each unit (recommending a set of instructional materials and learning methods covering the area of expertise that she needs to study).*

<p><b>Key functionalities</b></p> <p><b>1 Add learning materials to the repository</b></p> <ul style="list-style-type: none"> <li>- Different formats (doc, pdf, ...)</li> <li>- Conversion at runtime</li> <li>- Add learning materials to courses</li> </ul> <p><b>2. Create Questionnaire</b></p> <ul style="list-style-type: none"> <li>- Define number of questions</li> <li>- Write questions</li> </ul> <p><b>3. Predefined classified answers</b></p> <ul style="list-style-type: none"> <li>- Write standard answers</li> <li>- Create classification for these answers</li> </ul> <p><b>4. Build corpora of text prototypes for training testing and configuration</b></p> <ul style="list-style-type: none"> <li>- the system implements a text management (sub-)system to (semi-) automatically build corpora from initial small corpora</li> <li>- graded and annotated text (e.g. student answers) by adding to the corpora prototypical texts from the available repository</li> </ul> <p><b>5. Collect sample answers from students</b></p> <ul style="list-style-type: none"> <li>- Students provide their answers</li> <li>- Answers are classified by at least two tutors</li> </ul> <p><b>6. Train the service</b></p> <ul style="list-style-type: none"> <li>- The service uses the provided data to train the classification process</li> </ul> <p><b>7. Positioning Task</b></p> <ul style="list-style-type: none"> <li>- The student is answering the questionnaire</li> <li>- The services provides hints for the learner (feedback is given)</li> <li>- The tutor decides based on this hints the units and learning method for each unit</li> </ul>	<p><b>Techniques and data:</b></p> <p>Text categorization techniques, LSA, maximal phrases analysis Learning Contents (with dependencies between topics) General language corpus Database for</p> <ul style="list-style-type: none"> <li>• Decisions</li> <li>• Feedback</li> <li>• Grading</li> </ul> <p>Portfolio</p> <ul style="list-style-type: none"> <li>• Collection of texts</li> <li>• Answers on structured questions</li> <li>• Online forum contributions</li> </ul> <p><b>Specific techniques and data:</b></p> <p>Domain Corpus Ontologies Job descriptions &amp; competences Learning goals (formalised as list of concepts from the ontology) Training corpus</p> <ul style="list-style-type: none"> <li>• Input texts (portfolio)</li> <li>• Annotated texts</li> </ul>
<p><b>Validation</b></p> <p>Our validation goals are to investigate to which extent:</p> <ul style="list-style-type: none"> <li>• the learner gets useful feedback to establish a learning path</li> <li>• the learning path provided saves time for learning and increases the satisfaction of the learners</li> <li>• the education company needs less resources (time of tutors) for the positioning procedure</li> </ul> <p>We will validate the services in the domain of IT in German. The service uses IT training materials and specific questionnaires to enable interpretation of student knowledge. Whenever available, online forum discussions will be used as an additional resource.</p> <p>The validation will take place at “Bitmedia” in Graz (educational company) with unemployed people (learners) and internal staff. We will run a pilot with 15 learners and 2 tutors (cf. D7.2). Instruments used are semi-structured interviews, questionnaires and measurement of time usage. Both quantitative and qualitative analysis will be undertaken.</p>	

### System Overview: Learner Positioning Service (4.1)



## 4.2 – The LTfLL Service for Monitoring Conceptual Development (CONSPECT)

**Problem:** In modern educational practice, lifelong learning is a mix of formal and informal opportunities, both of which emphasise development of independent self-directed learning. This is encapsulated by workplace learning environments where learning trajectories reflect interactions of learners with peers and professionals from their own domain, as well as with “clients” (e.g. patients, students, or customers). In such complex circumstances, it is sometimes difficult for learners and their tutors to discern clearly how a specific individual covers key topics and how they might apply this to “real life” issues. Hence, self-directed learning requires support, through formative feedback, but a key issue is how to gather and evaluate the evidence on which such feedback could be based.

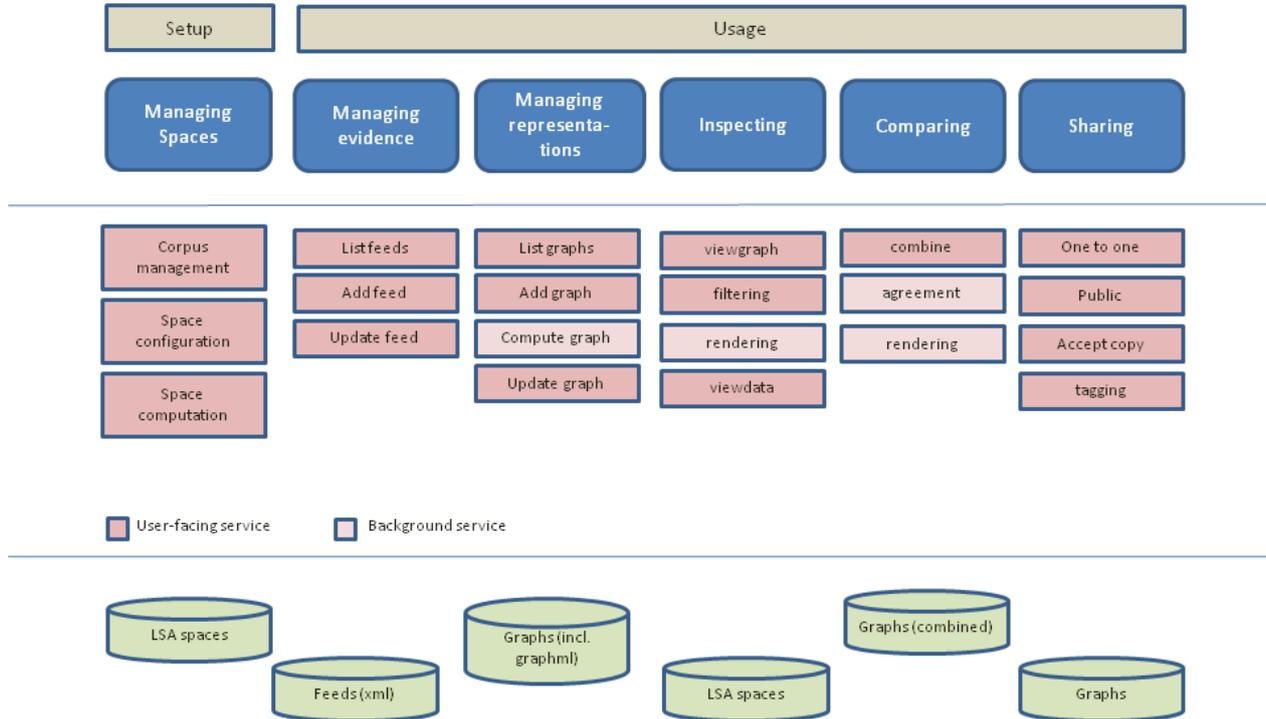
**Solution:** CONSPECT is designed to provide a means by which a learner’s conceptual development can be monitored and feedback opportunities are promptly and effectively provided. CONSPECT monitors conceptual coverage of topics based on an automated analysis of textual evidence presented by learners, in comparison with others or over time, to identify shortcomings, misconceptions, and emerging learning opportunities within the learner’s zone of proximal development. It uses textual artifacts from both individuals and groups of learners, such as essays or blogs, to establish a visual model, a “conceptogramme”, of how learners relate concepts to one another. Learners are able to compare their own model with an emerging group reference model in order to identify differences, or to get feedback on where to seek advice from their tutor. This enables learners to monitor their development over time. Tutors can inspect the conceptual development of individuals and groups and use the outputs of the service to inform their interactions with learners.

**Story:** *Marion, a learner in the Medical School is on her placement Cardiology for eight weeks. She attends a series of sessions in which she shadows her tutors, observing how they perform their tasks. In the same period, she assesses her competence in diagnosing symptoms and relating these to treatments within predefined PBL cases. This is done in a collaborative setting where she interacts with peers and tutors in online forums. She typically spends time reviewing her previous learning and researching new topics that help her to understand the workplace tasks and the PBL case. As part of her learning process, she reflects on her progressing knowledge and the lessons learnt, maintaining an online journal.*

*Marion launches CONSPECT, selects the topic space Cardiology and submits her knowledge evidences (from her online reflections and discussion contributions). CONSPECT displays a topic representation based on Marion’s input, showing the identified concepts and their relations. Marion compares her result with three models: that of her peer Peter, an emerging group model, and a tutor defined reference model. Finally she decides to make her model public to feed the emerging group model and to allow others to compare their representations with hers.*

<p><b>Key functionalities</b></p> <p><b>Learner: Enter Topic Space</b>                  Go to the topic space URL                  View help                  View reference model(s)                  Create/update personal model                      Add evidence                      View representation                      Save current version                  Make current version public (add to data for emergent group model)                  Compare earlier version with current                      select earlier version date                      view representation                  Compare current version with reference model                      select reference model                      view representation                      get reading suggestions                  Compare current version with emergent group model                      select emergent group model                      view representation</p> <p><b>Teacher: Setup area</b>                  Create/update reference model                      Add evidence                      View representation                      Save current version                      (emphasize most relevant concepts)                  Generate topic space</p> <p><b>Teacher: Enter Topic Space</b>                  Select participants &amp; topics:                      select desired tag                      select desired representation                      representations are protected by credential-based access control                  Compare topic representations                      Participant vs. reference model                      Emergent model vs. reference</p>	<p><b>Required techniques and data:</b>                  Background Corpus                  Domain-specific Corpus                  Latent-semantic space                  Key concepts                  Concept clusters (via semantic closeness)                  Concept visualiser                  Versioning of models                  Compare tool for models                  Individual model                  Reference model                  Emerging group model                  Input collector/preprocessor                  Authorisation                  Authentication</p> <p><b>Specific techniques and data:</b>                  Prepare service for a course :                  . Data collection                  . Data processing techniques</p>
<p><b>Validation</b>                  Our validation topics are to investigate the extent to which the CONSPECT:</p> <ul style="list-style-type: none"> <li>• accurately captures what the learners know by the LSA representation</li> <li>• identifies to tutors those learners who differ the most from their peers</li> <li>• provides the learners more concise, objective, and timely formative feedback</li> </ul> <p>We will validate the software in the domain of Medicine in English. The service uses PubMed to enable interpretation of RSS feeds, for example student journal entries or a discussion board feed. Our validation instruments are interviews with tutors, focus groups with students, questionnaire, and system logging. Both quantitative and qualitative analysis will be undertaken.</p>	

### System Overview: Monitoring Conceptual Development (4.2)



## 5.1 – The LTfLL Chat & Forum Analysis and Feedback System

**Problem:** Educational institutions have widely embraced the use of internet, web technologies and its collaborative environments to supplement standard learning practices. Learners’ interactions show their (individual and group) knowledge regarding the course materials as well as their capacity to apply this knowledge. However, what happens in these interactions is often beyond the control of the teachers, who mainly focus on the results of the collaboration processes. More involvement to assess individual contributions, to moderate or to provide relevant feedback concerning the quality of these web interactions with regards to both content and collaboration appears to be time-consuming and comes with a high cognitive load.

**Solution:** C&F-AFS supports tutors and learners in the analysis of the collaboration among learners and of their individual activities in virtual teams: It produces various kinds of information about discussions in chats and forums, both quantitative and qualitative, such as metrics (e.g. the relative importance of each utterance, learner grades both globally and for particular features like the involvement in the collaboration, the social effect of what they said, etc.), and content analysis results (such as the coverage of the key concepts supposed to be discussed and the discourse threads). C&F-AFS also provides visual feedback about the interactions and the social participation. The visualization of the conversation and forum is interactive, that means the learners and tutors may explore different perspectives and discussion threads, they may view implicit links discovered by the system between utterances or posts, they may see the threading of using different concepts.

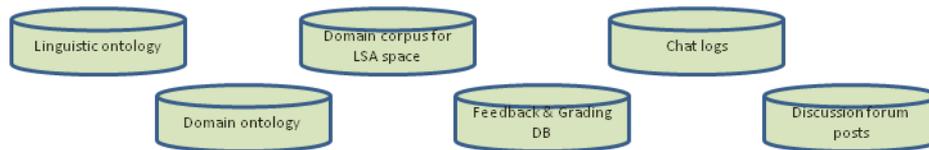
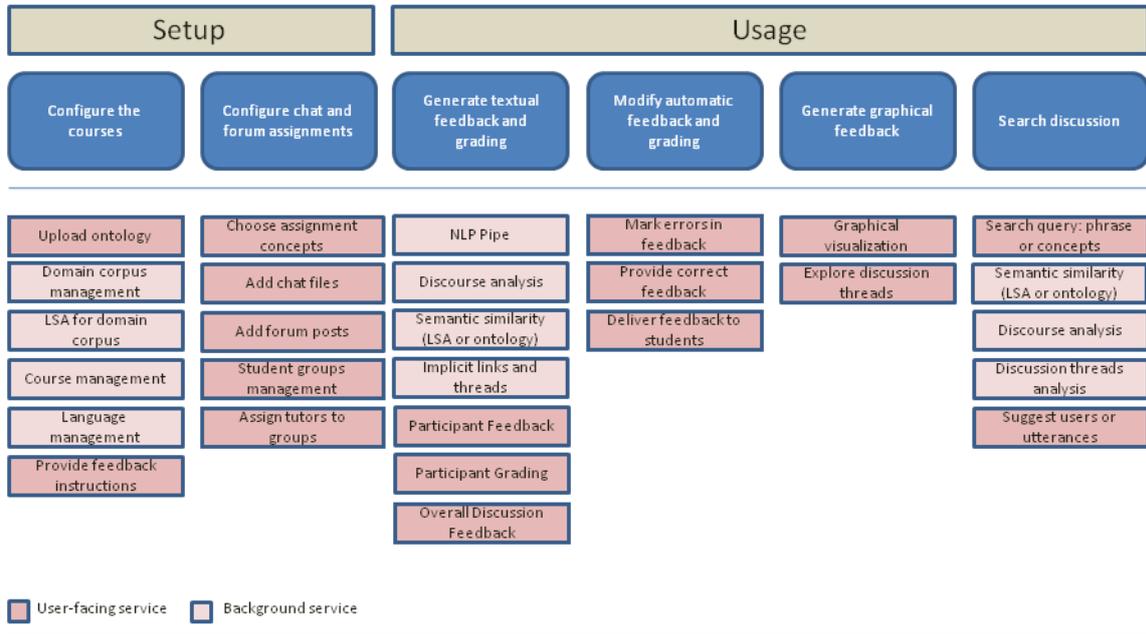
**Story:** *At the NLP course, we use a forum and a chat system to collaborate with our classmates. Moreover, the evaluation of these activities constitutes an important part of the final grade for each student. Dr. Smith starts discussion topics on the forum after each course. The tutors have to moderate and solve possible conflicts by offering explanations. In addition, the teacher gives us topics to discuss in small groups using the chat system.*

*As preparation for a chat, the tutors group us in small teams of 4-7 participants, each of us being assigned a topic to study and then support in debates. I read the most interesting materials about that topic in order to understand the subject in detail. During the discussions, my peers present other points of view, we debate and inter-animate, all of these improving my own and the others’ understanding of the domain. After ending a chat session, the C&F-AFS provides feedback and preliminary scores both for myself and for my group as a whole.*

*When I’m using C&F-AFS for a forum it shows me threads and/or posts that are related to a concept, it recommends peer-learners that have a good understanding of particular topics and it offers preliminary feedback about my activities for self-reflection.*

<p><b>Key functionalities (indicate what is ready/available)</b></p> <p><b>Preparation</b>          Configure the course (select language &amp; domain)          Provide additional configuration parameters          Upload grading and feedback instructions          Configure (forum &amp; chat) assignments          Assign tutors to chat groups and forums          Create student groups (for chat - introduce roles, key concepts and associated features to be discussed)</p> <p><b>Learner discussion with C&amp;F-AFS</b>          Select assignment          Upload chat log          Upload forum threads database          Ask for analysis of a chat          Ask for analysis of posts in discussion forum          Search in forum by concept(s)          Return automatic textual feedback containing data about the discussion as a whole, about each utterance or post and about each learner          Return automatic graphical feedback (graphical visualization of the discussion)          Explore the graphical visualization of the discussion          Return grading proposal          Request the final feedback from the tutor</p> <p><b>Assess learners contribution with C&amp;F-AFS</b>          Request forum view report with statistics          Explore the graphical visualization of the discussion          Edit the automatic feedback and grading          Mark assignment as completed          Save info about automatic feedback errors          Request course stats and reports</p>	<p><b>Required techniques and data:</b>          Instant messaging system          Discussion forums          NLP pipe (with modules adapted to the considered language)          Discourse analysis          Domain ontology or LSA          Lexical ontology (WordNet)          Social Network Analysis          Feedback database</p>
<p><b>Validation</b>          Our validation goals are to investigate the extent to which:</p> <ul style="list-style-type: none"> <li>- Learners get useful feedback immediately after they finish a chat discussion and just-in-time for forums</li> <li>- C&amp;F-AFS offers a graphical visualization that improves the understanding of the conversations</li> <li>- The time needed to provide final feedback and grading is reduced</li> <li>- The quality of the feedback increases resulting from analyzing collaborative chat sessions and discussion forums</li> <li>- It is easier to maintain consistency of feedback between different tutors</li> <li>- The system offers formative feedback to adapt and improve the course by harvesting the large volume of data produced by the learners</li> <li>- Using C&amp;F-AFS mediated collaboration improves the learning outcomes of the learners</li> </ul> <p>The feedback service for chat conversations will be validated during the Human-Computer Interaction (HCI) course, running for 14 weeks in the first semester (ends in February 2010) at the Computer Science Department, "Politehnica" University of Bucharest, . The validation will involve the following participants:</p> <ul style="list-style-type: none"> <li>- 8 undergraduate students, year 4 (senior year);</li> <li>- 4 tutors / teaching assistants for the HCI course and 1 professor for the HCI course;</li> </ul>	

### System Overview: Chat & Forum Analysis and Feedback Service (5.1)



## 5.2 – The LTfLL Online Synthesis Advisor *PenSum*

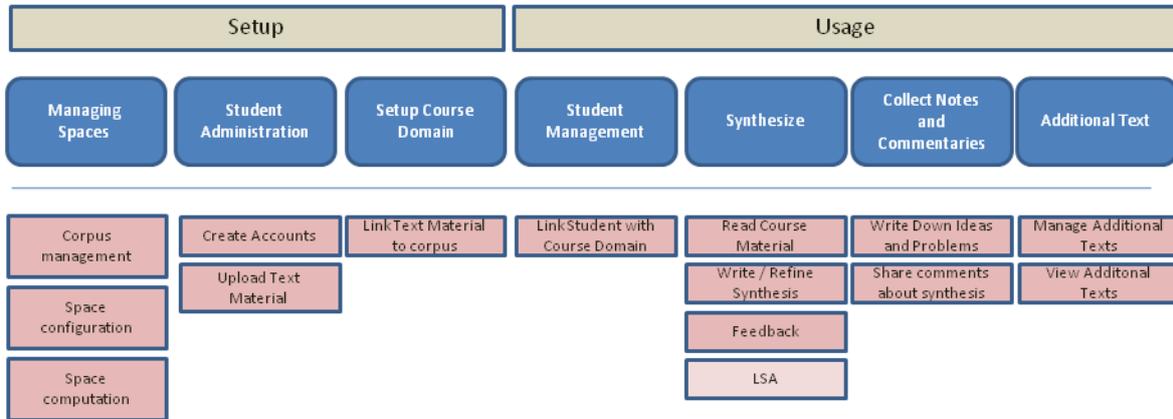
**Problem:** In numerous educational contexts, learners produce textual reports (e.g. summaries, essays, syntheses) about the learnt notions, and feedback is offered about their results. The problems they encounter are long waiting time for feedback (stagnating them in the writing process) and the limited feedback opportunities that do not stimulate explorative approaches (“what if-trials”), but force them to hand in mainly completed versions. During writing, it is difficult to self-assess ongoing work and to identify possible misunderstandings. The teacher has only a limited overview of the learners’ progress, may find out specific problems too late to use them during the current course, and may be unsure about the consistency of feedback given by tutors.

**Solution:** Service 5.2 will support learners in the automatic assessment of their essays (summaries, syntheses) in order to let teachers focus on higher-level activities (e.g., individual learner guidance or course design). *PenSum* analyses how well learners understand course texts as shown by their textual productions; it provides frequent just-in-time feedback on the ongoing writing activities (relevance of written sentences, inter-sentence coherence of the synthesis, résumé of each course sentence).

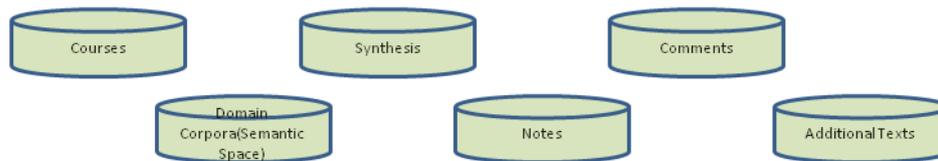
**Story:** *Ulysses launches PenSum as a Web service. He selects the course domain Natural Language Processing and starts to express the main questions, problems and notions he wants to tackle in this course in a dedicated notepad. Then he starts to write a synthesis of the most important ideas of the course, according to his understanding. Whenever Ulysses is uncertain about whether he grasps the most important notions of a text, he asks support from PenSum. The system gives Ulysses feedback on his written synthesis, e.g. the relevancy of sentences, or the inter-sentence coherence of his synthesis. Ulysses is in control of his own learning process, he requests feedback whenever he wants and he can update his notepad according to the main points he understands and can continue writing on the same synthesis or one on another topic.*

<p><b>Key functionalities</b></p> <p><b>Preparation</b>          Define course domain          Add course texts          Train to system          Assign learners to a course domain</p> <p><b>Learner work with <i>Pensum</i></b>          After selecting the course domain to synthesize, either the student writes a new synthesis or the student reads/revises a already-written synthesis.</p> <p>Then students can ask a feedback about their synthesis and write learning questions in a notepad. These possibilities are available all the time and they can freely switch to one another.</p> <p>Then feedback is prompted in a textual (in tooltips) and graphic form (underlining of some synthesis/course sentences).</p> <p>Course texts, synthesis and content of notepad are stored in a <b>database</b>.</p> <p>The feedback is based on <b>cognitive and computational models of writing assessment by using LSA</b>.</p>	<p><b>Techniques and data:</b>          Semantic similarity computing (LSA)          General language corpus          Course corpus          Database for the course texts, synthesis, learning questions (notepad) and students’ tracks.          Cognitive and computational models.          Feedback generator.</p>
<p><b>Validation</b>          Our validation goals are to investigate to which extent the:</p> <ul style="list-style-type: none"> <li>• students’ understanding is fostered through free exploration of the course content;</li> <li>• students can get feedback on their productions as often as they want;</li> <li>• teacher’s activity is more directed on higher levels of students’ activity (guidance, collaborative learning management, production assessment on style).</li> <li>• users find the software easy to use</li> <li>• users’ cognitive load is reduced.</li> <li>• students can get correct feedback (i.e., performing tests beforehand to measure whether the validity of cognitive models is satisfying)</li> </ul> <p>We will validate the software in the domain of educational technologies in French. Both quantitative and qualitative analysis will be undertaken. We will run a pilot with 20 students in educational sciences (year 4) and 1 teacher. Instruments used are: semi-structured interviews with teacher to collect judgments and comments on pedagogical soundness; Questionnaires to students to collect data on their appreciation of the service, its usability and learning aspects. In addition we collect data on cognitive workload. We track students’ activity (number of loggings, synthesis, learning questions, feedback), and compare their grades of synthesis.</p>	

### System Overview: Online Synthesis Advisor *PenSum* (5.2)



■ User-facing service   
 ■ Background service



## 6.1 – The LTfLL Formal Learning Support System Course Editing Service

**Problem:** Teachers who develop or adapt courses have insufficient tools to help them locate learning material that is appropriate for the intended learners.

**Solution:** The Formal Learning Support System (FLSS) as part of the Common Semantic Framework (CSF) offers various browsing and searching functionalities (for more details see D6.2). A simple text search returns documents with a varying degree of relevance. Semantic search makes the results more relevant, by using different wordings of a concept and exploiting implicit semantic relations in the text. Browsing the domain ontology helps the teacher to organize taxonomically his/her curriculum.

The learning materials in FLSS are annotated automatically. Users can browse these texts with annotated concepts and contexts, and thus can compile manually a curriculum, a glossary and a test for the learners that will take into account the learner's profile (as a group and individually).

**Story:** FLSS offers a repository of learning objects (tutorials, courses, papers, tests, etc.) as well as facilities for search, concept browsing and document similarity measuring over the information stored in Common Semantic Framework. This information comprises the repository of learning objects, comments from peers, other materials provided by external services. A teacher may begin searching for materials, or (alternatively) may want to get some insights on the topic starting with browsing over the domain ontology to get an appropriate set of concepts. The ontology is accessible as a whole as well as in specific thematic parts for this purpose. In both cases, through the use of various searches – mainly text and semantic, and through the browsing of the domain ontology the teacher can choose materials to be included in the course. The teacher can additionally get results, based on similarity among the learning objects. The teacher may also add documents to the repository. Such documents will be automatically annotated. The automatic pipe annotation includes: word level segmenting; linguistic NLP analysis; concept annotation grammar, coreference relations. The annotated documents and the ontology might be used for semantic and contextualized search, structuring the content, making glossaries and tests for the learners. The coreference annotation improves the coverage and precision of the concept annotation, thus making the retrieved results more informative and to the point. For example, if the concept grammar returns the concept 'Web page' and its immediate context, then through the coreference also non-adjacent contexts would be returned, which refer to HTML with 'It' or 'page'.

<p><b>Key functionalities</b></p> <p style="text-align: center;"><b>0. Preparation</b></p> <ul style="list-style-type: none"> <li>- Common Semantic Framework running as a background service for FLSS;</li> <li>- Document annotation service;</li> <li>- Search service;</li> <li>- Stakeholder-oriented interface.</li> </ul> <p>FLSS might be installed as a stand-alone application, or on a web server.</p> <p><b>Resources:</b>                  Domain ontology                  Concept grammar for the target language(s)                  Repository of Learning objects</p> <p><b>1. Add and process a new document to the repository</b></p> <ul style="list-style-type: none"> <li>- Automatic document annotation with concepts and coreferences</li> <li>- Semi-automatic support for annotation of images</li> <li>- Semi-automatic support for discourse annotations</li> </ul> <p><b>2. Search within the repository of learning materials</b></p> <ul style="list-style-type: none"> <li>- Text based search</li> <li>- Semantic search</li> <li>- Combination of both searches</li> <li>- Ontology navigation and browsing:                         <ul style="list-style-type: none"> <li>- Tree view</li> <li>- Concept map view</li> <li>- Concept list view</li> </ul> </li> <li>- Document ranking</li> </ul> <p><b>3. Retrieval results</b></p> <ul style="list-style-type: none"> <li>- Concepts or text excerpts with contexts</li> <li>- Documents, retrieved by their similarity</li> </ul> <p><b>4. Commenting and manipulation on learning material</b></p> <ul style="list-style-type: none"> <li>- manual addition of comments</li> <li>- manual editing, deletion, addition or combination of text excerpts</li> </ul>	<p><b>Required techniques and data:</b></p> <p>Domain Ontology (<i>used for browsing; semantic search, semantic text and image annotation</i>)</p> <p>NLP annotation pipe (<i>used for detecting the domain concepts and coreference relations in the texts</i>)</p> <p>Search modes (<i>used for conducting text, semantic, contextualized searches</i>)</p> <p>Image annotator (<i>supports the manual semantic annotation of images</i>)</p> <p>Annotation editor (<i>provides possibilities for adding manually tags, links, notes</i>)</p> <p>Concept map editor (<i>a visualization that represents the document and search results in a comprehensive way</i>)</p>
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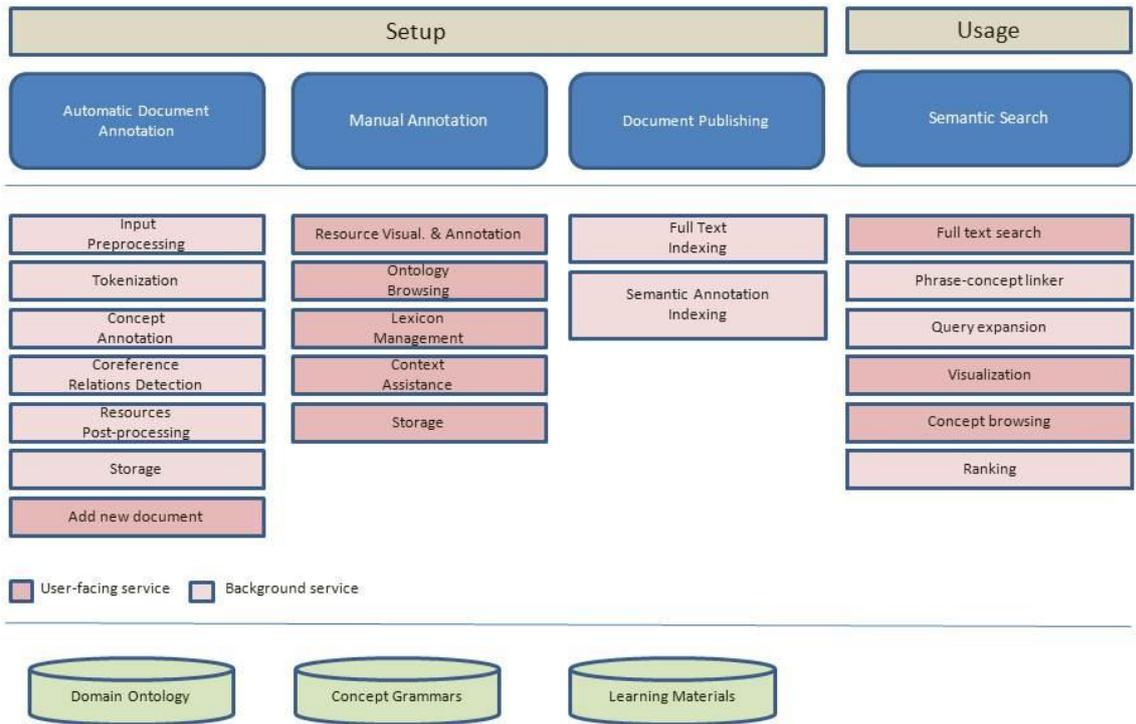
### Validation

Our validation goals are to investigate to which extent the FLSS offers:

- a structured specialized repository, whose topics are related to concepts
- a substantial number of topics for the course in the specialized repository
- precise search within the corpus
- tutors the returned context (in terms of related concepts as well as annotations of other users) of the requested term for compiling course materials

We will validate the FLSS software in the domain of IT in English .The service uses a structured specialized repository, initial interface, document annotation and to enable search, annotation and browsing activities. We will run a pilot with 5 teachers and 3 vice-Deans in Humanities. Instruments used are think-alouds with teachers and interviews with vice-Deans. Both quantitative and qualitative analysis will be undertaken.

### System Overview: Formal Learning Support Service (6.1)



## 6.2 – The LTfLL Informal Learning Support Service to Locate Content and Peers

**Problem:** Learners have problems locating content on the web that is appropriate for a given learning task. It is difficult to identify which resources can be trusted to be of sufficient quality, especially for beginners. Moreover, learners often operate in isolation, because neither teachers, nor peers are available to offer support all the time.

**Solution:** The LTfLL Common Semantic Framework (CSF) supports stakeholders in identifying, retrieving and exchanging the relevant learning material for a given learning task. The CSF includes the Formal Learning Support System (FLSS) related to task 6.1 and the Informal Learning Support System (iFLSS) related to task 6.2. The iFLSS supports the knowledge discovery process through an ontology enhanced with the vocabulary of the Community of Practice (CoP) and by recommending material on the basis of the content, tags and users belonging to the CoP. Communication is facilitated through the use of social networks and new communities of learners can be established through the recommendations provided by the system.

**Story:** *I need to refresh my knowledge of Java for the implementation part of my thesis. I attended a course in the first year of the program but I have forgotten many details. My tutor told me he can recommend some online courses and books. Rather than waiting for his mail, I decide to use the Common Semantic Framework (CSF) that will help me find relevant content and people with its search system that is based on tags and users. I enter my query and various resources are returned, such as textual material (from Delicious), videos (from YouTube), and slides (from Slideshare). I can also get information on whether other people have used this content and whether I can get in touch with them. I restrict the search to people in my own network and that of my tutor. Some of these social contacts are proficient in Java development and I can contact them when I need assistance. The CSF returns as a result of my query also a fragment of an ontology which shows the relation between the terms of my query and other terms. In this way, I can find additional material and discover new related resources.*

<p><b>Key functionalities</b></p> <p><b>Preparation</b></p> <ul style="list-style-type: none"> <li>- Define topic</li> <li>- Select ontology fragment</li> <li>- Enrich the fragment on the basis of tags</li> <li>- Crawl data from social network sites</li> </ul> <p><b>Learner employs the iFLSS</b></p> <p>The learner has to find relevant content for his learning task. He can use the <b>ontology browsing functionality of the CSF to improve his knowledge on the domain</b> of the topic. The learner can also <b>use this browsing functionality to retrieve documents</b>. In addition to the browsing based search, the learner can search for relevant materials in two other ways. The first option is to employ <b>semantic search on the basis of the domain ontology</b>. The second search functionality is based on the structure of the <b>social network and the tags attached to resources</b>. In addition to the document itself, the retrieved results indicate the peers associated with these resources which are part of his social network, enabling the learner to contact these persons. The result of this search is trusted because it has the guarantee of a peer recommendation. The different search possibilities are all available and the learner can freely switch to one another according to his needs. The ontology, tags, annotations and links to resources are stored in the semantic repository.</p>	<p><b>Required techniques and data:</b></p> <p>Common with CSF 6.1:</p> <ul style="list-style-type: none"> <li>• Domain ontology on Computing</li> <li>• RDF repository</li> <li>• Search service</li> <li>• Graph visualization (ontology and network)</li> </ul> <p>Unique:</p> <ul style="list-style-type: none"> <li>• 2 million triples crawled from Delicious</li> <li>• structured information from DBpedia (used for automatic enrichment of LT4eL ontology)</li> <li>• various similarity measures (used for automatic enrichment of LT4eL ontology)</li> <li>• ontologies related to social networks and/or semantic web (SIOC, FOAF, SKOS, SCOT, MOAT)</li> </ul>
<p><b>Validation</b></p> <p>Our validation goals in round 2 are to investigate the extent to which the:</p> <ul style="list-style-type: none"> <li>• Services help the learners to locate relevant learning material that is used in the context of a learning task on the basis of:</li> <li>• An ontology enriched with social tags</li> <li>• Tags and resources provided by the CoP</li> <li>• Learner gets a better view of how a concept is related to other concepts within a domain and becomes aware of the vocabulary of the domain</li> </ul> <p>We will validate the software in the domain of Computing in English with 6 Computer Science students and six non-CS students (Dutch and Romanian learners). The learners will use the search and recommendation services based on social networks, ontologies and tags to find relevant materials. The employed validation instruments will be questionnaires, interviews and manual rating of results. Both quantitative and qualitative analysis will be undertaken. The students will be asked to connect to one another using different social networking applications and then to use these applications to provide bookmarks for links they find useful or to add presentations or videos that are of interest to them. After using these applications, the students will be asked to use the CSF services in order to obtain recommendations of resources and peers and also to search relevant content in their network.</p>	

**System Overview: Informal Learning Support Service (6.2)**

