Project no. 027087

TENCompetence

Building the European Network for Lifelong Competence Development

Project acronym: Integrated Project TENCompetence

Thematic Priority: 2.4.10

D2.2 Updated use case models and underlying vision documents and pedagogical model definitions

Due date of deliverable: 30-11-2007
Actual submission date: 08-01-2008

Start date of project: 01-12-2005 Duration: 4 years

ALTRAN SDB

Version 1.0

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Building the European Network
For Lifelong Competence Development

TENCompetence IST-2005-027087

Building The European Network for Lifelong Competence Development

Project Deliverable Report

D2.2 Updated use case models and underlying vision documents and pedagogical model definitions

Work package	WP2 - Requirements & Analysis of the Integrated System
Task	2 and 3
Date of delivery	**Contractual**: 30-11-2007 **Actual**: 08-01-2008
Code name	D2.2 **Version**: 1.0 Draft ☐ Final ☒
Type of deliverable	Report
Security (distribution level)	Public
Contributors	ALTRAN SDB, University of Bolton, INSEAD, OUNL, SURF, UvA
Authors (Partner)	Rob Koper (OUNL), Judith Schoonenboom (UvA), Jocelyn Manderveld (SURF), Eric Kluijfhout (OUNL), Naiara Sacristán (ALTRAN SDB), Miguel Arjona (ALTRAN SDB), David Griffiths (University of Bolton), Albert Angehrn (INSEAD), Peter van Rosmalen (OUNL)
Contact Person	Miguel Arjona (ALTRAN SDB)
WP responsible	Miguel Arjona (ALTRAN SDB)
EC Project Officer	Martin Májek
Abstract (for dissemination)	This deliverable contains the following 3 topics: • An analysis of the current status of the project in relation to the lessons learned in the first two years of the project and the changes observed in the world outside of the project. In addition an approach is outlined what to achieve and how to achieve this in the remaining life-time of the project. • The results of a study on pedagogical models for lifelong competence development. The study shows that in order for lifelong competence development to be optimally facilitated, four main aspects should be organised: organise the learning context; organise the different stages of lifelong competence development; put the learner into control of their own learning; provide resources and guidance from which learners can learn. • A set of usage profile including use case models for the PCM describing the most important cases of use of the PCM.
Keywords List	Pedagogical model definition; usage profile; scenario, use case; vision document

TENCompetence Project Coordination at: Open University of the Netherlands
Valkenburgerweg 177, 6419 AT Heerlen, The Netherlands
Tel: +31 45 5762624 – Fax: +31 45 5762800

1 Executive summary

During the first twelve months, a functional specification has been developed based on the domain model, its underlying theories, and the contributions from the different research groups in WP5-8. This work enabled us to define the first seven TENCompetence high level use cases and to expand them through activity diagrams, the building blocks for the development of the first version of the Personal Competence Manager (PCM 1.0). Obviously, since formulating the TENCompetence proposal but also since the specification of the first version of the PCM the world as the consortium saw it, has changed. The focus of this deliverable, therefore, is to establish and maintain the common vision of the project as a combination of an analysis of lesson learned, in and by the project, in relation to its changing environment. The deliverable contains 3 sections:

- An analysis of the current status of the project (chapter 2);
- The results of an study on pedagogical models for lifelong competence development (chapter 3);
- A set of usage profile for the PCM (chapter 4).

In Chapter 2, an analysis is given of the achievements of the project, mid-way, and the challenges the project has to face to achieve its objectives all in relation to the progress made so far and the changes observed in the world outside the project. The two most important observations made are (1) that there is a need to focus not merely on the integrated functionality of the PCM but also on distinct, limited usage profiles to meet specific desires of the users; (2) Web 2.0, its technology as well as the user expectations it has created, challenges the current approach taken in TENCompetence. An approach is outlined what to achieve and how to achieve this in the remaining life-time of the project. This approach has been developed, stepwise, in a special working group the 'Vision group' (WP2-task 2a), comprising visionary senior researchers from the consortium partners and has been discussed and elaborated upon in a meeting with all Work-package leaders. The background details of this meeting and of the meetings of the Vision group are available in appendix 1-4.

Chapter 3 describes the results of task 2b, the development of pedagogical models for lifelong competence development. The main research question explored, is: What aspects of learning have to be organised by those who offer lifelong competence development opportunities in order to optimally facilitate learning? The study showed that in order for lifelong competence development to be optimally facilitated, four main aspects should be organised: organise the learning context; organise the different stages of lifelong competence development; put the learner into control of their own learning; provide resources and guidance from which learners can learn.

Finally, in Chapter 4 (task 3) based on the results of the analysis of the Vision group and the study on the pedagogical models the first seven high level use cases have been extended with five usage profiles, including use case models, describing the most

important cases of use of the PCM, for both the current and the next release. These usage profiles will be managed as change requests in the next cycle and incorporated to the functionality of the system in the following versions. The five usage profiles are the following:

- **Follow Course**: In this usage profile, the PCM is used in order to follow a course in three different scenarios: Corporate Training, Adult Education and seminar or tutorial group.
- **Create Course:** integrating visual editing and publishing into a single, integrated, and easy to set up and use system.
- **Personal Development plan**: In this usage profile, the PCM is used for working with their Personal Competence Development Plan, which means creating the plan, following it, and reflecting on the progress.
- **Knowledge Management**: This profile is directed at setting up communities to share knowledge about various topics. The resources and discussions about the resources are at the centre, organised per topic and in knowledge areas (better terms can be selected).
- **Overview**: exploring resources, persons and competence profiles.

2 Overall analysis and approach

In this chapter we provide an analysis of the project's progress and identify the major challenges for the future; define four strategies to meet these challenges; and provide an update for the major activities of TENCompetence.

The analysis is the result of WP2, task 2a, i.e. to "*provide a common vision for the project at large and for the work in WP3-8 specifically*". The two most important observations resulting from the analysis are:

(1) There is a need to focus not merely on the integrated functionality of the PCM but also on distinct, limited usage profiles to enable specific desires of the users;

(2) Web 2.0, its technology as well as the user expectations it has created, challenges the current approach taken in TENCompetence.

An approach is outlined what to achieve and how to achieve this in the remaining life-time of the project. This approach has been developed, stepwise, in a special working group the 'Vision group' (WP2-task 2a), comprising visionary senior researchers from the consortium partners and has been discussed and elaborated upon in a meeting with all Work-package leaders. The background details of this meeting and of the meetings of the Vision group are available in appendix 1-4.

2.1 Taking stock and facing challenges

During first twelve month, a functional specification has been developed based on the domain model, its underlying theories, and the contributions from the different research groups in WP5-8. This work enabled the consortium to define the first seven TENCompetence's high level use cases and to expand them through activity diagrams (c.f. D2.1), the building blocks for the development of the first version of the Personal Competence Manager (PCM 1.0). Obviously, since formulating the TENCompetence proposal but also since the specification of the first version of the PCM the world as the consortium saw it, has changed. In this chapter therefore an analysis is given of the achievements of the project, mid-way, and the challenges the project has to face to achieve its objectives all in relation to the progress made so far and the changes observed in the world outside the project. The analysis revealed that we have to face the following five, major challenges:

1. Software development cycles

The aspect WPs planned the delivery of a mix of components for integration into the PCM (WP5), an integrated authoring and delivery system (WP6), and prototypical tools for further elaboration and integration under DIP-3 (WP7 and WP8). All these were indeed delivered, but in some cases delayed and with limited user validation (small numbers, not in a real-life setting). The current PCM should have been delivered in June 2007 instead of September 2007. This has also complicated planning and executing the

pilots. Concluding, we can say that we have to be extremely careful with the synchronizing of the development cycles. At this stage the development cycles were insufficiently synchronised, took too long, and software sometimes required considerable revision before it could be released.

2. The world changes

Since formulating the TENCompetence proposal (late 2004, early 2005), but even since the specification of the first version of the PCM (end 2006), the world as the consortium saw it, has changed. Already during project year 1 of the project it turned out that the number of existing open source components for integration into the PCM (e.g. as developed by the e-learning framework[1]) was far more limited than expected.

In addition Web 2.0, its technology as well as the user expectations it has created, challenges the current approach taken in TENCompetence.

3. Collaboration within and between WPs

Within WPs the work is typically divided into tasks. The tendency is to distribute tasks along the lines of partners, and sometimes even to assign to individuals. The result is too much fragmentation and work carried out in isolation.

Although aspect WPs were deliberately defined in such a way that their interdependency is minimal, in the final TENCompetence infrastructure they will all have to deliver components that operate on shared underlying services, and provide a common 'look and feel' towards the end-user. At present aspect WPs are insufficiently aware of the functionality and underlying services developed by WP3 onto which to integrate these future components.

4. Common ground

To be able to cooperate effectively and efficiently in a complicated project like TENCompetence requires a shared vision and convergence on key concepts in the field of competence development. The TENCompetence RTD activities lead to new knowledge; the external world keeps changing; and new staff joins the consortium continuously. Thus creating common ground and a shared vision is not a one-time activity at the start of the project (as we initially planned), but instead seems to require continuous pro-active efforts.

5. PCM usability

The present PCM release already incorporates most of the anticipated functionality, though part of it at a basic level and/or through placeholders. This integrated functionality will especially appeal to professional users. The novice or average end-

[1] http://www.elframework.org/

user, however, is presented with a) too much functionality for often limited needs, and b) an interaction design that is (too) complicated. The challenge is to make the PCM more scalable and user-friendly to attract not only corporate but also individual users.

2.2 Addressing the challenges

The five challenges identified on the basis of the analysis are closely interrelated. The following set of strategies will be applied to address these challenges. They will provide a common vision for the project at large. The implications for the work in WP3-8 in the second half of the project are covered in section 2.1.3 “Implications for planned project activities”.

Focus on core output

Although the overall output of TENCompetence over the first two years is quite impressive, we experienced problems with timely software delivery. At the same time the lack of suitable existing Open Source services - like for example QTI tools - requires additional - initially unplanned - development efforts. This dilemma can only be tackled by a re-orientation on the core tasks of TENCompetence.

In the last 2 years of the project therefore a distinction will be made between ‘core tasks’ which will be prioritised, with until they are finished about 80% of effort dedicated to them, and ‘additional tasks’ to which WPs can direct their remaining time. Such core tasks focus on creating prioritised software components - core components. A core component qualifies as such when it covers a distinct usage profile (see the next paragraph or chapter 4 for a detailed description). A core component should therefore be used and tested in depth by/with end users. Some aspect WPs may have more than one core, which will be developed in order of priority.

In addition to focussing on core components, the PCM architecture will allow the integration of existing web tools that users require, but which are not core to the project (like chat, forum, etc.).

Increase usability: usage profiles and web clients

To make the TENCompetence technical infrastructure more attractive to individual users requires a) shielding these users from functionality that is not required for their role and/or task and b) creating interaction designs tailored to the users’ specific roles and/or tasks. This will be realised through the creation of ‘usage profiles’. Such a usage profile only exposes the functionality required for a specific task; uses a vocabulary that fits the users’ role and/or task; has an intuitive interaction design; and has an attractive graphical design.

To lure new users used to web 2.0 tools we need attractive web clients[2] in addition to the present rich client platform (RCP) of the PCM. Such web clients have to incorporate web2.0 principles to meet present day's user expectations. Usability tests will be carried out on all components delivered.

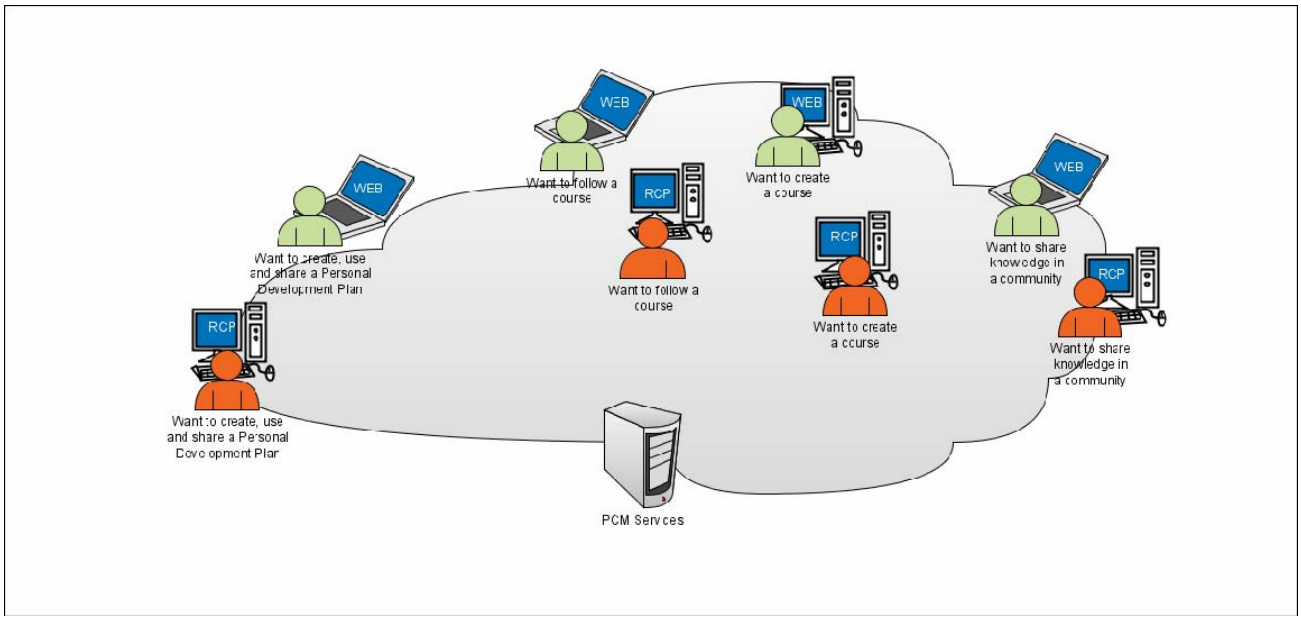


Figure 1. Examples of high priority usage profiles rendered through web-clients and the RCP.

Increase programming output

The analysis of the first two project years revealed a delay in software delivery, and at the same time it was concluded that more emphasis should be put on developing web clients to pull in new users in addition to the present rich client functionality that mainly appeals to 'power users'.

As a result programming efforts will shift from rich client development to web client development, and at the same time overall development capacity needs to be increased. Recruiting additional staff proved difficult over the past year, and training junior staff is time-consuming and makes further demands on the already overburdened senior programmers.

To facilitate a realistic development process, given these constraints, in the last two years of the project we will employ the following set of strategies:

[2] Tools that can be directly accessed and used through a browser, and that do not require any software to be installed on the user's PC.

a) No further extension of present functionality of the integrated rich client PCM v1.0, but only: a) implement present placeholders; b) resolve CRUD[3] discrepancies with the present prototype implementations of the aspect Work Packages; and c) improve its interaction design (most of the latter to be realise in the first part of year 3).
b) Steer development efforts from developing a fully integrated rich client PCM (as in the first 2 years) towards the implementation of distinct usage profiles.
c) Preferably implement the usage profiles as web clients, with the first batch of web clients on the basis of already existing PCM services.
d) Implement rich clients *only* when a) they have almost been completed already, *or* b) functionality is otherwise difficult to implement (as with an integrated LD authoring and deployment environment). The usage profiles that are completed as rich clients for 'power users' may next be developed as web clients for less demanding users.
e) The present integrated rich client PCM will only be 'maintained' by integrating new rich client usage profile implementations as they become available.
f) The web clients will be developed using tools a) with which the present developers are already familiar, and/or b) that have a relatively low entry threshold, thus make it easier for inexperienced programmers within and outside the partnership to contribute to their development.
g) The different architectural layers - services, rich clients and web clients - will be developed and maintained by distinct development teams recruited from various partners, and headed by senior programmers.
h) Special activities will be initiated to coordinate knowledge exchange and cooperation between these teams.

Creating common ground and a shared vision

Creating common ground and a shared vision in an integrated project proves a major challenge, even after two years, between as well as within WPs. The following measures are required to address this:

- Identify the basic issues where common ground is lacking (this is a technical as well as a vision issue).
- Create attractive training environments that make it very clear (by maximizing cognitive dissonance through questioning) where the discrepancies are.
- As aspect WPs till now had fragmented knowledge of what was going on in WP3 and the other aspect WPs, each team should keep updated with the latest version of the PCM rich client platform, its underlying services, and the usage profile implementations in the other WPs.
- People within WPs should collaborate more. Teams should work on the same agenda collaboratively; people should be assigned to project tasks on the basis of their competences rather than on the basis of organizational affiliation, and fixed weekly online meetings should be scheduled in joint tasks and work is discussed.
- WP9 will provide specific mechanisms to introduce new persons to the project, to exchange knowledge between development teams, and to train staff where necessary.

[3] Create, Read, Update, Delete actions on data base fields.

2.3 Implications for planned project activities

Based on the analysis provided above, we now describe the major implications for WP3-WP8, in addition given the continued need for training we also will indicate the consequences for WP9, including their planning. Finally, we describe the status and consequences for the demonstration activities in the last phase of the project.

2.3.1 Research, technology development and innovation activities

In the second project year the TENCompetence technical infrastructure developed and piloted comprised:

- The integrated Personal Competence Manager version 1.0 (PCM v1.0), implementing a client-server architecture. The PCM v1.0 already incorporates most of the functionality that the final system is expected to contain, though with some placeholders. The PCM v1.0 was validated in two formal pilots.
- A number of 'proof of concept' software components, together with their application programming interfaces, for future integration into the PCM. These software components were user tested as part of their delivery procedure.

In the next two years, we plan to realise full PCM functionality, and extend the present client-server architecture to an architecture where the PCM server exposes services that will be consumed mainly by web clients and in some cases by rich clients. In addition to the PCM services the architecture also caters for inclusion of third-party web services and 'dedicated' services to be developed by individual aspect Work Packages. Widgets will allow the integration of the clients as Iframe, Flash or RSS in web portals or open source (web) platforms like ELGG[4] (social networking) of Moodle (LMS).

The web clients to be developed will provide a low threshold entry-point for new users, while the integrated rich client platform (RCP) will target 'power users'. Both web client and rich client functionality will be described in terms of 'usage profiles'.

Usage profile implementations are thus assembled on the basis of the services exposed by the PCM server, and will also consume web2.0 services provided by third parties (especially in the case of WP5).

This versatile architecture with dual client interfaces (web clients and rich client) will be realised through a phased approach to make it manageable:

[4] See http://elgg.org/

In the *first six months of year 3* (till May 2008) work will concentrate on:

- Realising the first five high-priority usage profile implementations (see chapter 4 for details) as a mix of web-clients and integration components for the RCP (see figure 2). The clients developed in this period will *only* consume the services provided by the present PCM server v1.0.
- Designing additional usage profiles for implementation after May, five of which have already been identified (see below).
- Elaborating PCM services in preparation for additional usage profile implementations after May 2008.
- Creating the TENCompetence metadata repository, which integrates business objects exposed by the various services and links to various resources/learning activities/units of learning. Each usage profile implementation links to this tool.

In the *following twelve months* (June 2008 - May 2009) we will:

- Elaborate existing, and realise additional, usage profiles as web clients and related widgets. In case this requires additional services (and possibly underlying data stores) that are consumed by more than one (web) client, these may be incorporated in the PCM server. Services required by one (web) client only, may be implemented as a dedicated service.

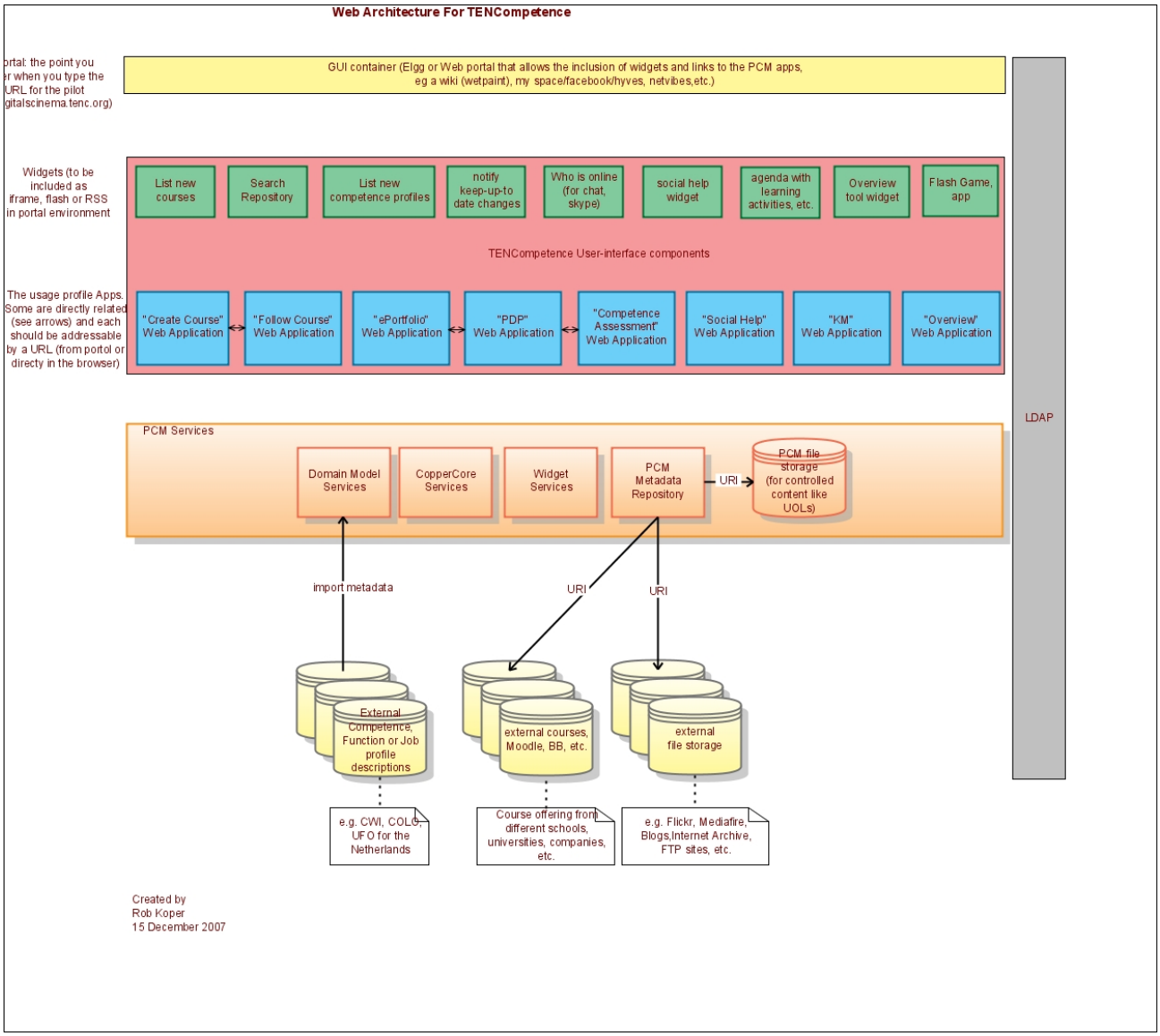


Figure 2. TENCompetence web architecture

In order to realise this we will work with four programming teams:

- The WP3 PCM Services Team, responsible for exposing services from the PCM server.
- The WP5-8 Web Client and Widget Teams, responsible for the implementation of the web client usage profiles. These teams will in effect operate as one team, working on various web clients.
- The WP5-8 Rich Client Teams, responsible for the implementation of the different rich client usage profiles. These teams will in effect operate as one team, working on various rich clients.
- The WP3 PCM Rich Client Platform Team, responsible for maintaining the integrated RCP through regular 'builds' of components delivered by the aspect WPs.

The selection of development tools in these different teams is based on: a) project principles (open source); b) a strong preference for a web2.0 approach, look and feel; c) the requirement that tools should preferably have a low entry threshold; and d) practical considerations like programmers familiarity with tools. Development coordination and tools selection is depicted below.

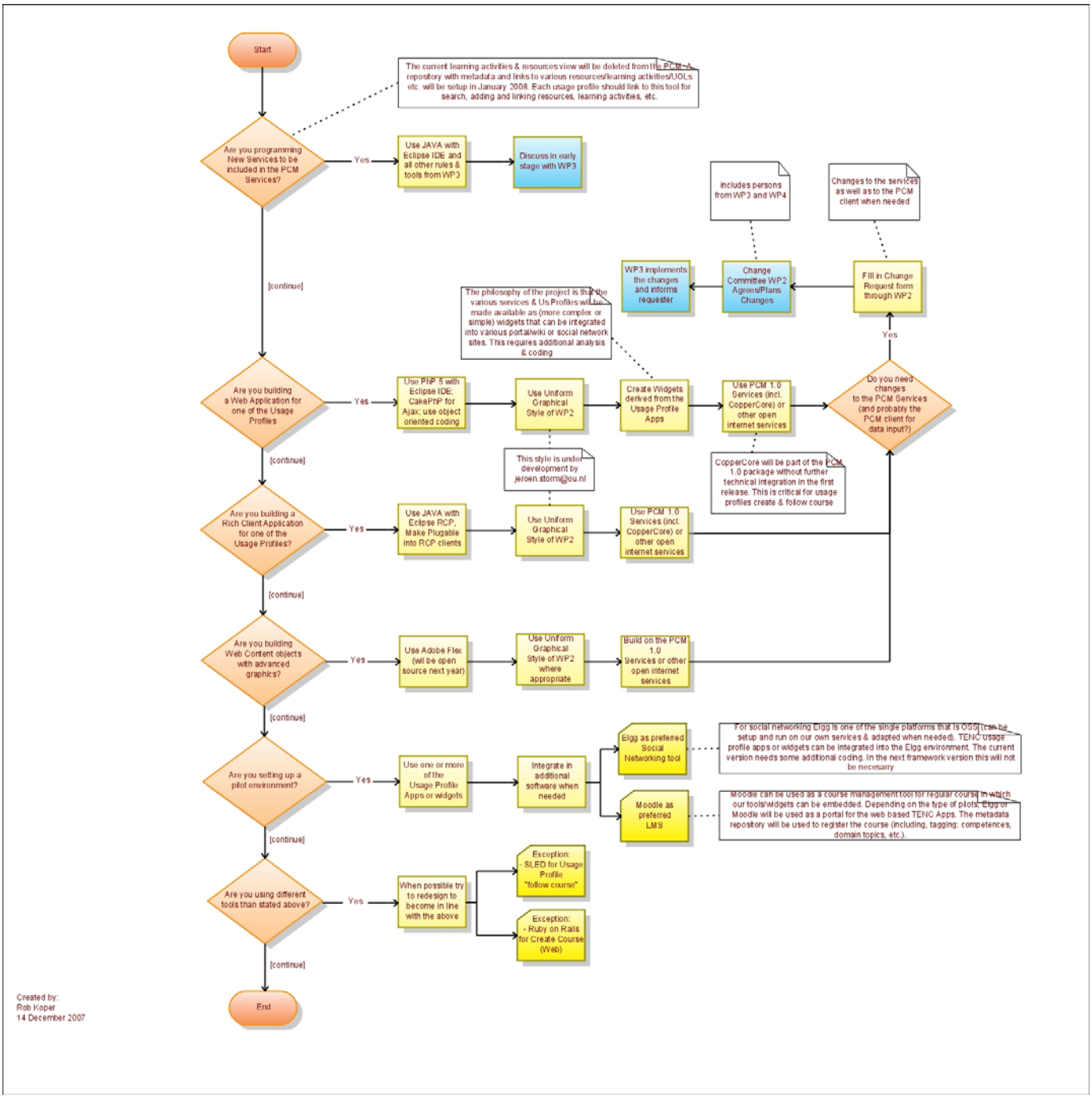


Figure 3. Development coordination and tool selection

Coordination and collaboration between the partners within the aspect Work Packages will be increased through weekly virtual meetings to stimulate participation, increase the tempo and synchronise efforts. Coordination between WP2, WP3 and the aspect WPs will be improved by regular face-to-face and on-line coordination sessions.

Taking into account the outcomes of the analysis, the Work Packages will work and cooperate on the basis of the following principles:

WP2 will be responsible for defining the usage profiles, which will be based on the high-level use cases and descriptions provided by the WP2 Vision Group. The actual development of the usage profiles will be the responsibility of ad-hoc working groups under WP2. These usage profiles so far are divided into the five high priority usage profile (see chapter 4) to be implemented before May 2008 by the aspect Work Packages, and additional usage profiles to be implemented after May 2008 (see figure 4) by the aspect Work Packages.

The five high-priority usage profiles to be implemented till May 2008 are:

- ‘Share knowledge in a community of practice’;
- ‘Create LD course’;
- ‘Follow LD course’;
- ‘Create and use personal development plans’;
- ‘Exploring resources, persons and competence profiles’.

The additional usage profiles that will be developed under WP2 before May, and to be implemented by the aspect Work Packages after May are:

- ‘e-Portfolio’;
- ‘Competence Assessment’;
- ‘Matching personal competences on job profiles to create personal development plans’;
- ‘Social help’.

WP2 will also be responsible for:

- Assessing and prioritising change requests for PCM services received from WP5-8, which will then be implemented by WP3 (see below).
- Defining the functional requirements for the integration of new rich client components into one integrated RCP, including its interaction design.
- Defining the functional requirements for the ‘TENCompetence portal’, integrating the various web clients.
- Providing overall guidelines for the graphical user interface of the various client implementations to secure a common look and feel between these clients.
- Functional acceptance testing of the integrated PCM.

WP3 will concentrate on elaborating further services on the basis of the PCM server, and will build frequent releases of the integrated PCM based on the rich client components delivered by the aspect Work Packages (see next). The requirements for new/changed services will come from their aspect Work Packages, derived from implementation requirements of the usage profiles. Such requirements will be evaluated and prioritised by WP2 (see above), after which WP3 will implement them.

In building PCM releases, WP3 will start with testing the technical quality of the delivered components. Functional quality of the components will be secured by the Aspect Work Packages themselves through user tests.

WP5-8 will each concentrate on implementing their 'core' usage profiles provided by WP2 as a mix of web clients (preferably) and rich client components (only when a web client implementation will not be able to provide the required functionality). This includes technical design, programming, development of widgets, and usability testing of the web- and rich client implementations. Work on these cores will be prioritised, i.e. until completion they will take up the majority of capacity (around 80%) of the aspect Work Packages. Clients will be user- tested within the aspect Work Packages themselves. Clients at the first stage will only use services (and related data stores) exposed by the PCM v1.0.

Before May 2008 the following usage profile implementations will be delivered:

- ***WP5***: 'Share knowledge in a community of practice', to be realised largely by selecting, testing and integrating existing web2.0 services. Integration may be realised through a 'Knowledge sharing home page' using API's to connect to underlying software services, but also by providing user guidance on how to use other web2.0 tools. Relating the TENCompetence identity management and grouping strategies to those in underlying - existing web2.0 - services are the major challenges here.
- ***WP6***: 'Create LD course', by integrating visual LD editing, QTI editing, course publishing, assigning users to runs, CopperCore, widget service, QTI service and SLED[5] into a single, integrated, and easy to set up and use system/rich client component, together with a widget server for integration into the PCM RCP. Complementary to this WP6 will implement the 'Follow LD course' usage profile through a web client. Work on the competence assessment usage profile will start as part of the non-core (20%) activities in this period.
- ***WP7***: 'Create and use personal development plans' by integrating the navigation and positioning tools prototyped under DIP-2. The rich client component will be developed first to replace the planning window in the present PCM RCP, and parallel to that the implementation of the web client.
- ***WP8***: 'Exploring resources, persons and competence profiles' (the 'Overview tool') comprising rich competence descriptions; network visualisation and navigation; and network management) will be integrated as rich client components in the PCM first, and as web clients next.

[5] http://www.elframework.org/projects/sled

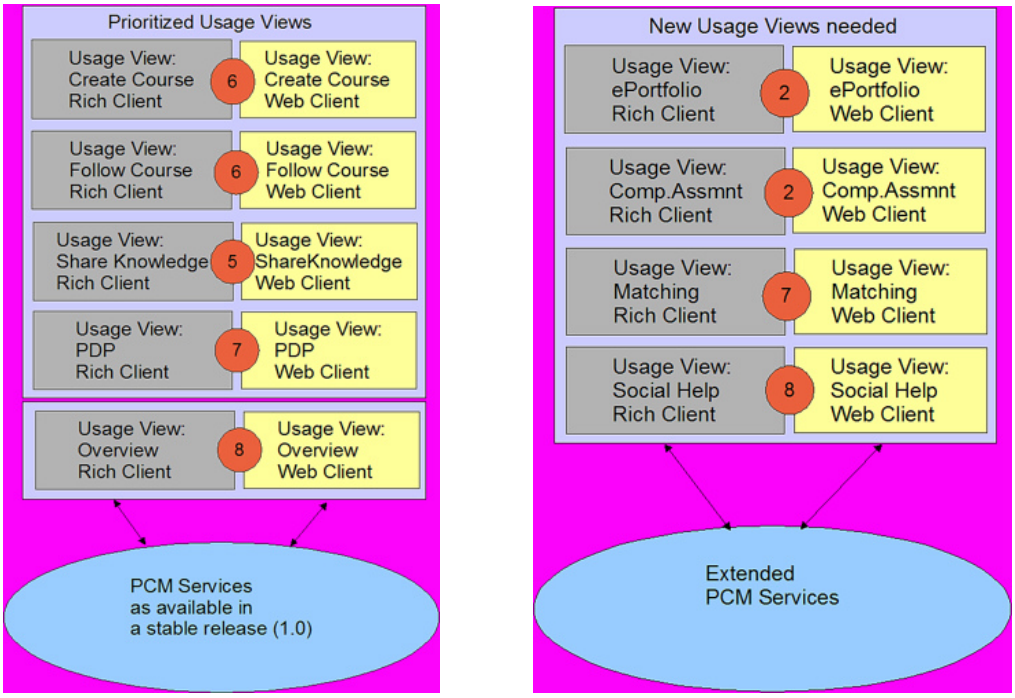


Figure 4. Usage profiles

After May 2008 the aspect Work Packages will concentrate on the following cores:

- ***WP5***: Further elaboration of 'Share knowledge in a community of practice' and cooperate with WP8 on the 'Social help' usage profile.
- ***WP6***: Further elaboration and integration with the other PCM services: integrate course bound assessment; extend authoring functionality with LD level b and c; and extend the widget server. Develop a web client for (simple) authoring and deployment using web 2.0 principles.
- ***WP7***: Further elaboration of the 'Create and use personal development plans' implementations, and technical design and implementation of the usage profile 'Matching personal competences on job profiles to create personal development plans'.
- ***WP8***: Include connection agents and game dynamics in the 'Exploring resources, persons and competence profiles' implementation, and implement the 'Social help' usage profile.

In case the new clients to be implemented after May 2008 require additional services (and possibly underlying data stores) the aspect Work Package contact WP3 to discuss how such services will be provided. If such a service will be consumed by more than one client, it may be incorporated in the PCM server. Services required by one client

only (e.g. CopperCore, Widget Service) may be implemented as a dedicated service. Final decisions, including those about implementation priorities, will be made by the WP2 Change Control Board.

2.3.2 Training activities

In principle as outlined in the Description of Work training activities would stepwise shift from an 'internal' orientation towards focusing on associate partners and other interested external audiences. However, given the identified challenges of 'the changing world' and 'retaining common ground', internal competence development and retaining common ground through training (WP9) and pro-active internal dissemination (WP10) remains necessary. Also the continuous turn-over of (junior) staff requires special efforts to bring new staff quickly up to date.

Therefore special coordination and training sessions will be organised by WP9 in close cooperation with WP2 and WP3 to secure a common understanding of the design and coordination of the software development activities by the various Work Packages.

2.3.3 Demonstration activities

In addition to version 1.0 of the technical infrastructure, TENCompetence has delivered the basis for the organizational infrastructure: the TENCompetence Foundation. Also a tender was put out at the end of year 2 to stimulate the active participation of SME's. The technical infrastructure was validated through a first cycle of pilots. Starting in the third year and in particular in the fourth year demonstration activities will be designed and implemented through further pilots and by 'activating' the Foundation.

For the pilot activities managed by WP4 this implies running the cycle 2 pilots; preparing the (Foundation) business model pilots ('real-life demonstrators') for the third cycle; developing tools that assist Associate Partners in participating as service providers in cycle-3 pilots; and providing related training (through WP9) to these Associate Partners. Major points of attention for pilots are:

- Pilots should be large enough to demonstrate wide-impact use of the TENCompetence infrastructure
- Pilots should implement a combination of usage profiles (the separate usage profile implementations will be user-validated by the aspect WPs themselves), demonstrating the flexible deployment of both the TENCompetence web-clients and the RCP.
- Pilots should start including associate partners in support roles in preparation for sustainability.

The TENCompetence Foundation has been established in such a way that it 'copies' the project aims, structure and planned activities. Starting in year 3 therefore, the demonstration and dissemination activities that involve associate partners, subscribers,

and the general public will be made available through a ‘Foundation interface’. The present consortium partners, present associate partners, and the SMEs that will be selected through the tender will be invited to formally join the Foundation. Account management, coordinated through WP10, will be strengthened.

3 Pedagogical model definitions

3.1 Introduction

This section is the report of task WP2.2b: the development of pedagogical models for lifelong competence development. According to the DIP-2, our task was to:

> "provide descriptions of new, promising innovative pedagogical approaches that meet the demands of lifelong competence development and new available learning technologies. The models integrate individual, collaborative and organisational learning, and knowledge management, and include technological artefacts as support for personal competence development. The models will be elaborated in successive specification documents - to be collected into an overall TENCompetence Pedagogical Models document (part of D2.2 and D2.3). The subtask feeds into subtask 2a, thus providing an overall vision, to be elaborated and specified towards WPs 3-8 in task 3."

Our work on pedagogical models is situated within the TENCompetence Domain model. We can clarify the relation between the pedagogical models and the Domain Model on the basis of the following early representation of part of the TENCompetence Domain model (Koper, 2005); see below Figure 5):

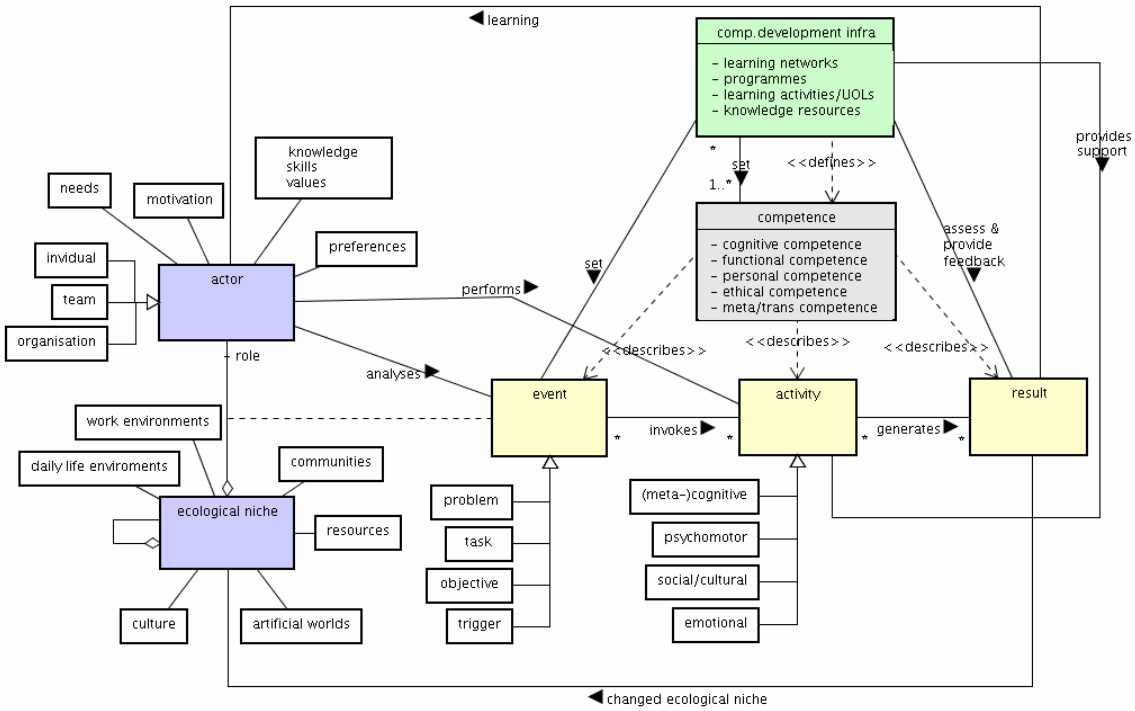


Figure 5 shows an actor involved in lifelong competence development, who is situated in a specific ecological niche or context (e.g. a discipline or environment), both with their own characteristics. The grey box indicates the type of competence that this actor has to develop, and the green box indicates the infrastructure that TENCompetence offers for supporting learning. Learning takes place as the actor, either self-directed or triggered by an event, performs one or more learning activities, with one or more results.

The following list of what Koper (2005) mentions as 'parts of competence development', could be seen as a first approximation of an organisational model, of a list of those things that should be organised in an infrastructure for lifelong competence development:

1. Identification and naming of competences for specific groups of actors within specific ecological niches (e.g. disciplines).
2. Positioning actors relative to these competences: which proficiency levels have already been achieved, which proficiency levels does one want to achieve.
3. Identifying the right communities and the integration of persons into these communities.
4. Identification and supply of adequate learning paths or curricula for the development of competences.
5. Identification and supply of adequate learning activities (tasks, problems etcetera) as part of these learning paths.
6. Identification and supply of adequate learning resources as part of these learning activities.
7. Support with the performance of learning activities and with the search for adequate knowledge resources.
8. Supply of assessments in order to provide feedback on the results of learning activities.

This report builds on an earlier TENCompetence deliverable, D6.1, in which the foundation was laid for what pedagogical models in TENCompetence should be.

In Deliverable D6.1 Pedagogical models for lifelong competence development were defined as a representation of a pedagogic activity using IMS Learning Design, which may or may not be a full Unit of Learning, and which can be used as the basis of authoring and delivering learning activities for the attainment of the desired competences using the TENCompetence infrastructure.

In TENCompetence, pedagogical models will not be used to constrain or guide the choice of pedagogies used in any given context, but rather to describe pedagogies compatible with life-long competence development as a basis for providing design methods and tools which support learning designers and practitioners in their practice. Thus, our model is not pedagogical and prescribing, but rather organisational, it is about how opportunities for learning can be organised in such a way that learning is optimally supported. Therefore we call it an 'organisational' model.

Our main research question is:

> What aspects of learning have to be organised by those who offer lifelong competence development opportunities in order to optimally facilitate learning?

This document contains the answers we found to this question. It is organised as follows. Section 3.2 explains the research method we used and the rationale behind it. In section 3.3 the organisational model resulting from our research is presented, followed by a detailed explanation of how it was derived from the literature we studied. Finally, section 3.4 contains our conclusions.

3.2 Method

Based on the preceding information, our task can be described as follows: to develop an overview of pedagogical elements that are needed in supporting life-long competence development, and to show their connections and functioning in context. Ultimately, this should lead to a description in the form of a specification. In operationalising this task, we use the concept of life-long competence development, as defined by Cheetham and Chivers (2005). They make a distinction between different classes of competences:

- cognitive competence (knowledge)
- functional competence (skills or competencies)
- personal competence (e.g. intelligence, flexibility)
- ethical competence (attitudes)
- trans-/meta-competences (e.g. communication skills)

In this sense competences can be seen as combinations of knowledge, skills, attitudes and the reflection on these components.

Ready-made organisational models for lifelong competence development do not exist. In working on this task, therefore, we could not simply adapt existing organisational models to our needs. We build the organisational models from various pieces that were available in different places. Our method was as follows: first we wrote down those disciplines, both theory- and practice-oriented, that we thought were closely enough related to life-long competence development, to be of use in developing our organisational models. Then, we collected relevant literature in each discipline. For all disciplines deemed relevant, one to three recent key publications and their references were used in our research. This literature was systematically scanned for useful organisational principles.

The disciplines and the key publications are listed below.

(Lifelong) competence development (Cheetham & Chivers, 2005; Eraut, 1994)	The literature on (lifelong) competence development is a very important source of information. It is most directly relevant to the topic. Important issues include (1) the aim of learning, which is competences, rather than courses or subjects in traditional education; (2) assessment, which is a continuous process of measuring life-long progress, rather than a one-shot exam and (3) the context, which is often related to professional work.
Competence-based education (Eraut, 2004; Hyland, 1993)	With lifelong competence development, competence-based education shares having competences as the basic organising principle of learning. From this tradition, much focus has been on curriculum innovation and on the changing role of the teacher. In competence-based education, teacher and assessor are different roles and ideally different persons. The teacher role itself undergoes a change from instructor to a more coaching role.
Distributed cognition (Pea, 1993; Perkins, 1993; Salomon, 1993)	Distributed cognition focuses on individuals in their daily surroundings, e.g. their workplace, and how they interact with the available tools. The main question is what and how people in such situations will have to learn. This will be completely different from learning in schools, in which individuals are asked to reproduce by heart factual knowledge, which is not connected to practice.
Experiential learning (Hyland, 1994)	Experiential learning states that in their everyday practice, people will encounter situations from which they can learn by reflecting on these situations. Learning on the workplace in the widest sense of the word is central. As in competence development, learning is seen as a continuous, repeating cycle of experience and reflection.
Development of expertise (Bransford, Brown, & Donovan, 2000)	As people engage in competence development or any other form of prolonged learning, they gradually move from being a novice to over the years becoming an expert. This process has been studied thoroughly.

Communities of practice (Lave & Wenger, 1991)	People learn in communities of practice, groups of people who together work towards the game goal, e.g. at the workplace. Communities of practices have been studied from the perspective how both individuals and groups develop, and how this development, thus including competence development, can best be supported.
Organisational learning (Argyris, 1999)	From the organisational perspectives, analyses have been made how organisational learning can best be supported. Strategies are described for stimulating 'double loop learning' in which individuals not only correct mistakes and mistaken knowledge, but also learn how to solve problems effectively. Problem solving thus contributes to competence development.
Validation of prior learning (Duvekot, 2005)	In lifelong competence development, individuals often have moments in which they wish or have to acquire some formal qualification. Validation of prior learning is about the matching of the competences that an individual, formally or informally, has already acquired, to the requirements of qualification programmes. A good fit between the two contributes to efficient competence development.
Adult learning (Knowles, Holton, & Swanson, 2005)	The majority of people engaged in lifelong competence development, are adults. From the perspective of adult learning, much study has been done on how to best support this age group. One very important point is how to deal with the enormous diversity among adult learners.
Navigational learning (Peterson & Levene, 2003)	Navigational learning is concerned with personalising learning in a situation in which a learner can choose from a large number of competence development paths through a variety of learning materials. This situation is very typical for lifelong competence development.

3.3 Results

This chapter starts with a summary of the organisational model that was derived from the literature listed presented above. After that, for each aspect of the model, it is explained how it was derived from the literature.

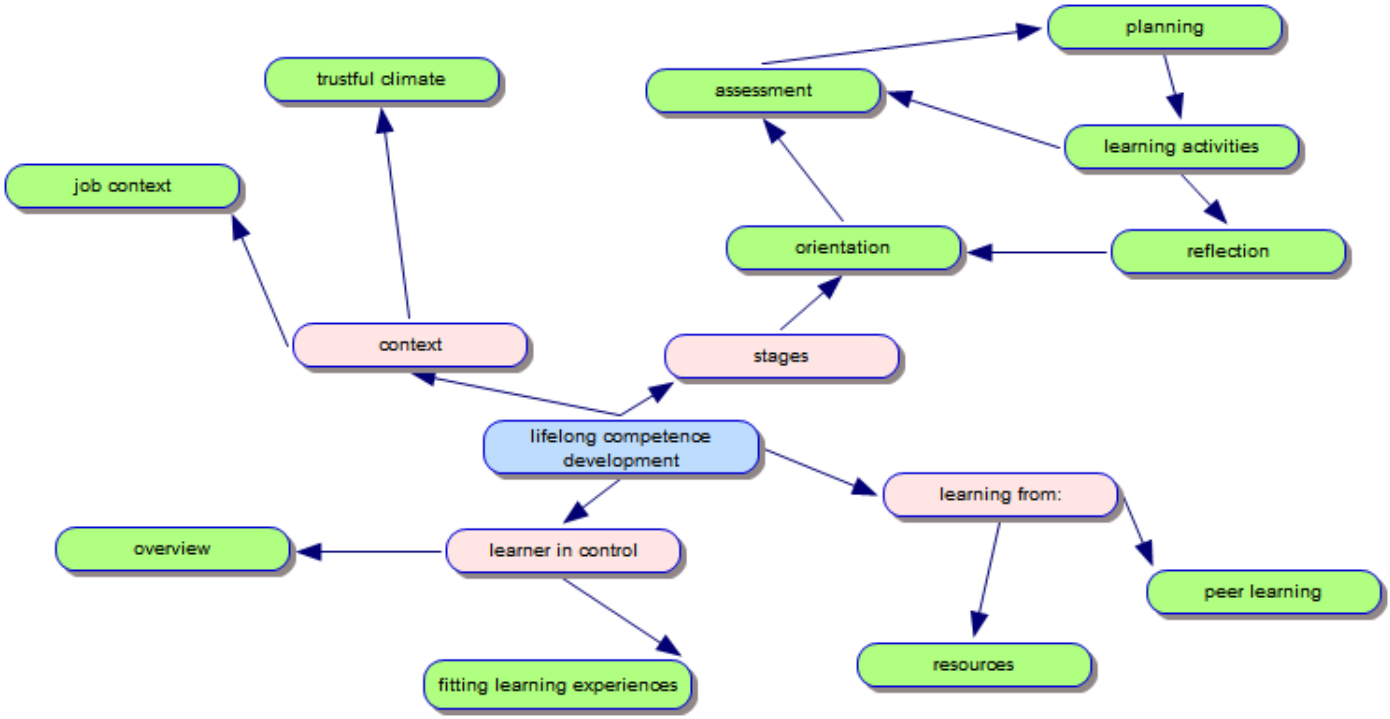


Figure 6. Model of aspects to be organised by those who offer lifelong competence development opportunities

Figure 6 visualises the model resulting from our literature analyses. It shows that from our analysis, four main aspects should be organised for an optimal support of lifelong competence development. Each aspect is composed of several underlying actions. These are comprised of:

- Organise the learning context
  - Integrate the lifelong competence development opportunities with learning on the job and learning in daily life
  - Create a trustful and warm learning climate
- Organise the different stages of lifelong competence development, which are:
  - Orientation
  - Assessment
  - Planning
  - Learning activities
  - Overview/monitoring/reflection

- Put the learner into control of their own learning:
  - Fit the competence development opportunities to their learning experiences
  - Enable peer learning and peer guidance
- Provide resources and guidance of which learners can learn from, which include:
  - Material resources
  - Human resources

Below we explain in more detail how these four aspects and their underlying actions were derived from the literature study.

Organise the learning context

The fist component of the organisational model for lifelong competence development is organising the learning context. Important here is the integration of learning into the job context and the creation of a trustful learning climate for learners.

There are several views on why learning in daily life should have a central position in lifelong competence development.

According to Knowles et al. (2005), experience is the richest source for learning, thus the core methodology of adult learning is the analysis of experience. A slightly different view on the relation between learning and experience comes from Kolb (1984). Kolb views learning as a continuous process grounded in experience, a process of adaptation through the resolution of conflicts and opposing viewpoints. For Lave and Wenger (1991) it is participation in a cultural practice which created opportunities for learning, and guaranteeing participatory access to these practices is an important task for those who organise learning.

Professional work of any complexity requires the concurrent use of several different kinds of knowledge in an integrated, purposeful manner. Yet this is difficult to achieve without significant interaction between formal teaching and professional practice (Eraut, 1994). Enough time should be devoted to learning how to apply theoretical knowledge to daily practice (Engeström, 1994; Eraut, 1994; Knowles et al., 2005).

Problems in their real-life situation make adults ready to learn. This applies especially to the transition between one developmental job stage to another. Adult learning should make use of this readiness to learn (Knowles et al., 2005).

Integration between formal and informal learning is also achieved in the validation of prior learning. At the beginning of a formal learning trajectory, the learner's knowledge and skills are measured, and this knowledge and skills may have been mastered in formal learning, informal learning, or a combination of both (Duvekot, 2005).

Learning climate

Create a trustful learning climate in which the learners can share feelings and thoughts, respect the feelings and thoughts of others and in which they can seek collaboration is an essential in organising the learning context of lifelong learners. Such a climate is characterised by physical comfort, mutual trust and respect, mutual helpfulness, freedom of expression, and acceptance of differences. Each student should be accepted as a person of worth and respects his feelings and ideas. Teachers should seek to build relationships of mutual trust and helpfulness among the students by encouraging cooperative activities and refraining from inducing competitiveness and judgementalness. Teachers should expose their own feelings and contribute their resources as a co-learner in the spirit of mutual inquiry (Knowles et al., 2005).

Organise the different stages of learning

Organising different stages of learning is the second component of the organisational model for lifelong competence development. This component compromises of:

- Orientation
- Assessment
- Planning
- Learning activities
- Overview/monitoring/reflection

Orientation

Lifelong competence development starts with the learner's awareness. Awareness involves two things. First, the learner has to become aware of his/here learning needs, why do they need to learn (Knowles et al., 2005). Second, the learner has to become aware of the competences s/he possesses and the values these competences have for others in certain contexts at certain moments (Duvekot, 2005).

The second step of the orientation phase is for learners to formulate their learning objectives. These learning objectives should be based upon the needs of the learners, but not solely. The learner's organisation should be involved as well. Duvekot emphasises that for organisations it is vital to understand that investing in people means investing in the goals of the own organisation. According to Knowles et al. (2005), the setting of learning objectives is a negotiation process between learner and organisation.

Assessment

Students should have the opportunity to regularly test their proficiency level with respect to the competence as a whole, independent from learning resources, in an assessment that captures the complexity of the competence in real life, and in which they have to collect evidence from their whole experience in both formal and informal learning.

A series of assessments over appropriate intervals of time would indicate progress and provide evidence for formative feedback, while their combined reliability would be considerably greater than the current system of occasional high stakes assessments (Eraut, 2004). Assessment, according to Duvekot (2005), should make visible and value the full range of qualifications and competences held by an individual. In an assessment the required competences should all be integrated together in larger, more complex chunks of behaviour, rather that treating them as separate bundles of knowledge and skills (Eraut, 2004). The assessment occurs irrespective of where the competences have been acquired, and through each learning path, formal or informal.

Planning

Learners should be enabled to make a planning for their learning, in close consultation with their organisations and tutors. Learners and tutors have a shared responsibility for planning, and mechanisms should be put in place that enable mutual planning (Knowles et al., 2005). Duvekot (2005) mentions the interplay between the individuals who need to be able to take control of their own learning and organisations who should facilitate the learners' individual learning paths. An implication of this stance, not mentioned explicitly, is that setting up an action plan must be a mutual undertaking.

Learning activities

The learning activities presented to the learner that make up the competence development opportunities should be based upon learners' experience, on real-life situations, on reflection on their own learning experiences, and on applying acquired knowledge to daily practice. Learning activities should:

- help learners recognise meaningful patterns of information
- make use of instructional procedures that speed pattern recognition
- help students learn about conditions of applicability
- provide models of how experts solve problems (Bransford et al., 2000)

According to Salomon (1993), in a rapidly changing world, one of the most crucial outcomes one expects of education is students' ability to handle new situations and meet new intellectual challenges. This ability, rather than efficiency of performance, should be in focus when designing education.

These learning activities should facilitate lifelong competence development. From a development point of view, this entails the development from being a novice to becoming an expert. From research on expertise, it is known that experts differ from novices on several dimensions. Four of them are directly relevant to education:

1. Experts notice features and meaningful patterns of information that are not noticed by novices. One dimension of acquiring greater competence appears to be the increased ability to segment the perceptual field (learning how to see). Research on expertise suggests the importance of providing students with learning experiences that specifically enhance their abilities to recognise meaningful patterns of information (e.g., Bransford, Franks, Vye, & Sherwood, 1989 ; Simon, 1980).
2. Experts' knowledge cannot be reduced to sets of isolated facts or propositions but, instead, reflects contexts of applicability: that is, the knowledge is "conditionalised" on a set of circumstances. One way to help students learn about conditions of applicability is to assign word problems that require students to use appropriate concepts and formulas (Lesgold et al., 1988; Simon, 1980). The concept of conditionalised knowledge also has important implications for assessment practices that provide feedback about learning. Many types of tests fail to help teachers and students assess the degree to which the students' knowledge is conditionalised.
3. Experts have acquired a great deal of content knowledge that is organised in ways that reflect a deep understanding of their subject matter (Bransford et al., 2000). Research on expertise suggests that a superficial coverage of many topics in the domain may be a poor way to help students develop the competencies that will prepare them for future learning and work. The idea of helping students organise their knowledge also suggests that novices might benefit from models of how experts approach problem solving--especially if they then receive coaching in using similar strategies (e.g., Brown, Collins, & Duguid, 1989).
4. Experts are able to flexibly retrieve important aspects of their knowledge with little attentional effort. The use of instructional procedures that speed pattern recognition are promising in this regard (e.g., Simon, 1980).

From the perspective of organisational learning, it is very important that double-loop learning is supported. Whenever an error is detected and corrected without questioning or altering the underlying values of the system (be it individual, group, intergroup, organisational or inter-organisational), the learning is single-loop. Single-loop learning occurs when matches are created, or when mismatches are corrected by changing actions. Double-loop learning occurs when mismatches are corrected by first examining and altering the governing variables and then the actions (Argyris, 1999).

Already Lindeman (1926) acknowledged that ‘experience is the richest resource for adults' learning’. According to the ‘andragogical model’ for adult learning, developed by Knowles et al. (2005), this has several consequences.

1. The emphasis in adult education should be on experiential techniques - techniques that tap into the experience of the learners, such as group discussions, simulation exercises, problem solving activities, case methods, and laboratory methods instead of transmittal techniques.
2. For adults, their experience is who they are. Thus, in any situation in which the participants' experiences are ignored or devalued, adults will perceive this as rejecting not only their experience, but rejecting themselves as persons.
3. Adults' orientation to learning is focused on their experience. Adults are motivated to learn to the extent that they perceive that learning will help them perform tasks or deal with problems that they confront in their life situations. Furthermore, they learn new knowledge, understandings, skills, and attitudes most effectively when they are presented in the context of application to real-life situations.

On the negative side, as adults accumulate experience, they tend to develop mental habits, biases, and presuppositions that tend to cause them to close their minds to new ideas, fresh perceptions, and alternative ways of thinking. Adult educators should try to discover ways to help adults examine their habits and biases and open their minds to new approaches. Sensitivity training, values clarification, meditation, and dogmatism scales are among the techniques that are used to tackle this problem (Knowles et al., 2005).

Overview / monitoring / reflection

The self-directing adult learner (Duvekot, 2005; Knowles et al., 2005) chooses his/her own learning trajectory. To be able to do so, some support is needed. At any point in their learning trajectory, learners should be enabled to monitor their progress, to reflect upon their results and their experiences. This monitoring and reflection can serve several goals, among them:

1. that learners get a sense of progress toward their goals (Knowles et al., 2005) and
2. that they can choose those learning activities that match their current progress (Peterson & Levene, 2003).

Monitoring and reflection can be performed by several means. Self-assessment (Knowles et al., 2005) and peer-assessment (Eraut, 2004) play an important role in professional life. The criteria for self-assessment should be developed in a joint effort by learner and teacher (Knowles et al., 2005). Progress is best indicated by a series of assessments (self-assessments or other types of assessment) over time, rather than having occasional high stakes assessments (Eraut, 2004).

Providing learners with an overview of what the whole enterprise is about, and what there is to be learned (Lave & Wenger, 1991) might also give them an indication of the progress they have already made. According to Levene, learners should be enabled to reflect on their trails, on the learning trajectory that they have gone through. Learners should be presented with alternative views of their learning trails.

Put the learner in control

Putting the learner in control by enabling them to find those learning resources that match to their readiness to learn, their prior experience, their needs, interests and proficiency levels is the third component of the organisational model for lifelong competence development. Learners should be in control to create useful competence development programmes which fit with their experiences. In lifelong competence development there should be a greater emphasis on individualisation of teaching and learning strategies (Knowles et al., 2005).

Prior experience exists of both resources and mental models. That the learning resources should match the learner's prior experience follows from the fact that their experience is itself the richest resource for adults' learning, it is what they are. Adults become ready to learn those things they need to know and be able to do in order to cope effectively with their real-life situations. The motivation of adult learners lies in satisfying their needs and interests. An especially rich source of "readiness to learn" is the developmental tasks associated with moving from one developmental stage to the next, e.g. in job promotion (Knowles et al., 2005).

Provide resources and guidance of which learners can learn from

The last component of the organisational model of lifelong competence development is formed by the provision of the widest possible range and well organised resources to the learners (Rogers, 1969). Resources are meant here as both materials and people. For learners there is support needed to find their way in the abundance of learning opportunities. Therefore it would be good if learners could have an overview of all the resources, and what there is to be learned (Lave & Wenger, 1991). Personalisation on resources, based upon the learner's preferences and comparisons between the learner's profile and the properties of resources, provide the learner the optimal support to make their choice in all the resources available (Peterson & Levene, 2003).

Besides the provision and support of resources learners should also be guided by coaches who provide high-quality feedback. Especially, guidance and learning from peers in situations where they work together has to be stimulated (Engeström, 1994). According to Lave and Wenger (1991), learners learn most in relation with other peers, as they engage in practices. They quote Butler, saying that where the circulation of knowledge among peers and near-peers is possible, knowledge spreads rapidly and effectively. Besides peers working together on authentic tasks, other forms of peer relations are mentioned which are forms of peer guidance: peer teaching (Engeström, 1994) and peer helping (Knowles et al., 2005).

3.4 Connecting the pedagogical model and the usage profiles

The activities described in the usage profiles (c.f. chapter 4) can be categorized under the headings of the pedagogical model. Some activities belong to more than one category. Note that the activities are not equally divided among the categories.

Organise the learning context

- *Integrate the lifelong competence development opportunities with learning on the job and learning in daily life*

  Discuss progress with tutor or employer

- *Create a trustful and warm learning climate*

  Register

  Engaging (adding peers to one's network)

Organise the different stages of lifelong competence development, which are:

- *Orientation*

  Search for a course

  Search for an activity

  Browsing knowledge networks

  Search topic areas or topics

- *Assessment*

  Carry out assessment activities

- *Planning*

  Create and adapt a PDP

  Publish plan

  Collaborate on plan

  View plan

- *Learning activities*

  Follow a PDP

  Navigate and use activities and resources

- *Overview/monitoring/reflection*

  Reflection on progress within pdp

  Mark courses as completed

  Mark activities as complete and reveal the next

  Write conclusions

Put the learner into control of their own learning:

– *Fit the competence development opportunities to their learning* **experiences**
– *Enable peer learning and peer guidance*

Participate in forums and chats

Exchange and share the things they make in the course

Discuss topics

Publish topic area

Collaborate topic area (viewers / collaborators)

Provide resources and guidance of which learners can learn from, which include:

– *Material resources*

Search for a course

Search for an activity

Browsing knowledge networks

Search topic areas or topics

Rating

Rate resources

Create a topic area

Fill the topic area with resources

Create topics under the topic area

Regroup the resources to different topics

Add new resources and activity descriptions

Manipulating the repository

– *Human resources*

Describing oneself

Engaging (adding peers to one's network)

Describing, discussing and debating

3.5 Conclusion & future directions

In this document we have investigated the question what aspects of learning have to be organised by those who offer lifelong competence development opportunities in order to optimally facilitate learning. We based our analysis on the literature study of fourteen key publications in areas relevant to lifelong competence development, namely (lifelong) competence development, competence-based education, distributed cognition, experiential learning, development of expertise, communities of practice, organisational learning, the validation of prior learning, adult learning, and navigational learning.

The outcome was that in order for lifelong competence development to be optimally facilitated, four main aspects should be organised: organise the learning context; organise the different stages of lifelong competence development; put the learner into control of their own learning; provide resources and guidance from which learners can learn.

If we now compare these four aspects to the early Domain model of Koper (2005), presented in the introduction, we see that each of them relates to specific aspects of the Domain model:

- Organise the learning context can be translated as ‘connect the learning to the existing ecological niche’
- Organise the different stages of lifelong competence development is visible with respect to two stages, namely: assessment, and the performance of learning activities
- Put the learner into control of their own learning can be translated as ‘take into account the actor characteristics’
- Provide resources and guidance from which learners can learn is visible in the green box, which includes both human resources (namely learning networks) and material resources (called ‘knowledge resources’)

Also, Koper’s (2005) list of eight aspects that should be organised in an infrastructure for lifelong competence development, can now be categorised under our four main aspects as follows:

Provide resources and guidance from which learners can learn:

> 3. Identifying the right communities and the integration of persons into these communities.
>
> 6. Identification and supply of adequate learning resources as part of these learning activities.

Organise the different stages of lifelong competence development: orientation

> 1. Identification and naming of competences for specific groups of actors within specific ecological niches (e.g. disciplines).

2. Positioning actors relative to these competences: which proficiency levels have already been achieved, which proficiency levels does one want to achieve.

Organise the different stages of lifelong competence development: planning

4. Identification and supply of adequate learning paths or curricula for the development of competences.

Organise the different stages of lifelong competence development: learning activities

5. Identification and supply of adequate learning activities (tasks, problems etcetera) as part of these learning paths.

7. Support with the performance of learning activities and with the search for adequate knowledge resources.

Organise the different stages of lifelong competence development: assessment

8. Supply of assessments in order to provide feedback on the results of learning activities.

Finally, we have made a first attempt to categorize the activities described in the usage profiles under the headings of the pedagogical model.

Our resulting model is a very first draft of an organisational model for lifelong competence development. Thus, further research should include validation and elaboration of the model. Our model is very different to traditional models of organising learning in formal education, or models for curriculum development. According to these models, providers of education should determine the rationale, aims and objectives, goals, content, learning activities, teacher role, materials and resources, grouping, location, time and assessment of learning. One question for further research could be to what extent our model would be relevant to traditional education, especially given the trend towards more open curricula, in which learner have more possibilities for creating their own learning pathways.

3.6 References

Argyris, C. (1999). *On organizational learning*.

Bransford, J. D., Brown, A. L., & Donovan, M. S. (2000). How people learn : brain, mind, experience, and school, *National Research Council. Commission on Behavioral and Social Sciences and Education* (Expanded ed., pp. X, 374). Washington, DC: National Academy Press.

Bransford, J. D., Franks, J. J., Vye, N. J., & Sherwood, R. D. (1989). New approaches to instruction: Because wisdom can't be told. In S. V. a. A. Ortony (Ed.), *Similarity and Analogical Reasoning*. Cambridge, UK: Cambridge University Press.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18,* 32-41.

Cheetham, G., & Chivers, G. E. (2005). *Professions, competence and informal learning*. Cheltenham: Edward Elgar.

Duvekot, R. (2005). VPL in 10 steps. In R. Duvekot, K. Schuur & J. Paulusse (Eds.), *The unfinished story of VPL. Validation and valuation of prior learning in Europe's learning cultures.* (pp. 11-27). The Netherlands, Utrecht: Foundation EC-VPL & Kenniscentrum EVC.

Engeström, Y. (1994). *Training for Change: New Approach to Instruction and Learning in Working Life.* Geneva: International Labour Office.

Eraut, M. (1994). *Developing professional knowledge and competence*. London: Falmer Press.

Eraut, M. (2004). A wider perspective on assessment. *Medical education, 38*(8), 803-804.

Hyland, T. (1993). Professional Development and Competence-based Education. *Educational studies, 19*(1), 123-132.

Hyland, T. (1994). Experiential Learning, Competence and Critical Practice in Higher Education. *Studies in higher education, 19*(3), 327-340.

Knowles, M. S., Holton, E. F., III, & Swanson, R. A. (2005). *The adult learner: the definitive classic in adult education and human resource development* (6th ed.). Amsterdam: Elsevier.

Kolb, D. A. (1984). *Experiential learning: experience as the source of learning and development*. Englewood Cliffs, N.J.: Prentice-Hall.

Koper, R. (2005). Het Stimuleren van Levenslange Competentieontwikkeling Met Nieuwe Leertechnologie [Stimulating lifelong competence development using new learning technology]. Keynote EduExchange December 7, 2005.

Lave, J. & Wenger, E. C. (1991). *Situated learning: legitimate peripheral participation.* Cambridge: Cambridge University Press.

Lesgold, A. M., Rubison, H., Feltovich, P., Glaser, R., Klopfer, D., & Wang, Y. (1988). Expertise in a complex skill: Diagnosing x-ray pictures. In M. T. H. Chi, R. Glaser & M. Farr (Eds.), *The Nature of Expertise* (pp. 311-342). Hillsdale, NJ: Erlbaum.

Lindeman, E. C. (1926). *The meaning of adult education.*

Pea, R. D. (1993). Practices of distributed intelligence and designs for education. In G. Salomon (Ed.), *Distributed cognitions: psychological and educational considerations* (pp. 47-87). Cambridge: Cambridge University Press.

Perkins, D. N. (1993). Person-plus: a distributed view of thinking and learning. In G. Salomon (Ed.), *Distributed cognitions: psychological and educational considerations* (pp. 88-110). Cambridge: Cambridge University Press.

Peterson, D. & Levene, M. (2003). Trail records and navigational learning. *London review of education, 1*(3), 207-216.

Rogers, C. R. (1969). *Freedom to learn*. Columbus: Merrill.

Salomon, G. (1993). No distribution without individuals' cognitions: a dynamic interactional view. In G. Salomon (Ed.), *Distributed cognitions: psychological and educational considerations* (pp. 111-138). Cambridge: Cambridge University Press.

Simon, H. A. (1980). Problem solving and education. In D. T. Tuma & R. Reif (Eds.), *Problem Solving and Education: Issues in Teaching and Research* (pp. 81-96). Hillsdale, NJ: Erlbaum.

4 An elaboration of the first five usage profiles

In this chapter the five high level use cases as described by the 'Vision Group' have been elaborated as an input to the interaction design. General requirements for the interaction design are the following.

Some general Requirements for the Interaction and User Interface Design

1. No new function may be added when these are not absolutely required from a usability perspective. The main objective is to hide functions for the user and to identify constraints that are related to the usage profile. So: keep it as simple as possible! The consequence is that we will only present the functions that are absolutely needed to perform the basic tasks within the profile. All other functions should be hidden (e.g. in the menu). So, the user should be concentrated on the task as much as possible. Windows and functions that are not directly needed should be hidden.
2. All the terms used in a usage scenario should match the function. So for instance:

    - In Knowledge Management the competences are "topics" and competence profiles are "knowledge areas".
    - In Create and Follow course these same elements are named "learning objectives".
    - In Personal Development Plans they have their current name Care has to be taken to not confuse users too much when they switch views (maybe the icons and colours stay the same).

3. The work-flow should be very straightforward: not include too many steps (3 steps is already quite a lot).
4. When using pop-up or overlay windows: do not present more than one at a time, but try to avoid them as much as possible.
5. The functions should be accessed at places that people expect from other applications.
6. The work-flow per task should be made visible to the user.
7. The user may not be asked technical questions like "on which server do you want to create the community". This should be set in the settings and only advanced users can have some controls to decide this.
8. Given sufficient user rights, people should be able to access the edit functions directly from the items they want to edit. For instance: when you want to add a new competence in the competence profile you should for instance right click on the profile or competence to add or edit).
9. The interaction and graphical design of the user interface should be attractive in a sense that people enjoy working with it. Currently, people tend to be frustrated when using it. This can only be tested by using frequent usability tests.

4.1 Usage Profile "Follow Course"

In this usage profile, the PCM is used in order to follow a course in three different scenarios: Corporate Training, Adult Education and seminar or tutorial group.

4.1.1 Brief narrative scenarios

1. - Corporate training

Typical context: The Human Resources department of the MegaMarket Superstore has defined competence profiles for all job descriptions in the organisation. They have provided self study courses which constitute competence development activities related to the competence profiles. Employees plan their learning through a PDP process. When they have taken a course they mark it as completed, and this information is reflected in their competence profiles held by MegaMarket.

Typical aim: follow a course to obtain a competence

Typical user: store manager who is has identified a need for developing her competence in using the stock control mechanism.

Workflow:

1. Log on to the system
2. Search for a course on stock control
3. Select one of the alternatives available
4. Enrol on the course, entering personal information
5. User presented with a sequence of learning activities, each of which consists of a description of the activity, some activity instructions, and documents to be used. A forum and chat are available enabling her to contact those who are also enrolled on the course.
6. Activities can be all visible at the start of the course, or shown one at a time when the previous activity is completed. Branching structures are also possible
7. User accesses the first activity. A forum and chat are available in which she can discuss the materials with others who are working on the same activity.
8. user works through the course activities in her own time, marking them as completed when she has finished each one
9. When user has completed them all she marks the course as completed.

2.- Adult Education

Typical context: The Government of the Balearic Islands has adopted proficiency levels A, B and C in Catalan as requirements for access to jobs in the public sector.

Typical aim: Follow online courses provided to help citizens achieve competences in Catalan.

Typical user: Francisca Forestera moved to the Balearic Islands five years ago. She understands a little Catalan, but needs a level A certificate in order to apply for a job as a secretary in the Town Hall.

Workflow:

1. Accesses the web of the Government and navigates to the Level A course.
2. Takes a number of simple tests to position herself among the various courses available at different proficiency levels.
3. In the light of the feedback chooses a course, and registers for it.
4. Works through the first learning activity, and when she has marked it as complete she is given access to the next.
5. The final learning activity includes a multiple choice test. The results indicate that she needs to study pronouns.
6. Navigates back to the pronouns activity and does it again.
7. Takes the test again, this time successfully.
8. Marks the courses as completed.
9. The next time she logs on she finds that the welcome page includes a list of the Catalan courses she has completed at level A, and those remaining in the recommended route to the Level A exam.

3. - Seminar or tutorial group

Typical context: A higher education course with defined learning objectives, but few learning resources. The focus is on discussion.

Typical aim: Conduct a tutorial group using the PCM

Typical users: the members of a tutorial group studying literature

Workflow:

1. The teacher prepares discussion activity topics and instructions (this would be in a CDP using the PCM authoring perspective).
2. The learners log on and find a task, with a discussion topic and a document containing the text to be discussed.
3. Learners and teachers carry out the task interacting in the forum and chat, and posting comments

4. Learners can post additional resources to the course topics (e.g. a link to a web document, with suggested topic for discussion or a description of the document). The teacher should be able to disable this functionality.
5. learners post texts for evaluation to the PCM file-space, which are associated with their portfolio
6. Teacher posts feedback and marks the activity as completed
7. Learners access the next activity

4.1.2 Most important activities in this usage profile + related action

Search for a course	a) Search for courses by name b) Search for courses by free text, resource or activity c) View course description, requirements, and commitment required by learner d) view ratings and comments made by past users e) Select the course and start using it
Search for an activity or resource for which the user has registered	a) Search for an activity or resource by name b) Search for an activity or resource by free text c) Return a list of links, which take the user to the relevant activity
Carry out assessment activities	a) Respond to simple questionnaires developed with the PCM b) View the results of taking simple questionnaires c) Carry out other assessment activities (functionally the same as other competence development activities, or (later) as Units of Assessment from WP6, but marked as being "assessment" activities in the interface)
Navigate and use activities and resources	a) Navigate between the nodes of the course b) Select activities to carry out, access related resources
Participate in forums and chats	a) Access and participate in forums in the context of course activities b) Access and participate in chats in the context of course activities

Exchange and share the things they make in the course	a) Find a document store shared with other learners on the course b) Search for or discover relevant documents within the file-space c) Post items to the shared document store
Rating	a) rate the course b) rate activities c) rate resources
Add new resources and activity descriptions	a) Add new activities to the existing course b) Add new resources to activities
Mark courses as completed	a) Mark a course as being completed b) Show list of links to completed courses to the user
Mark activities as complete and reveal the next	a) Mark activities as completed b) Enable the teacher to decide if activities should all be shown at registration, or revealed one at a time. This could be done in the PCM (if this is functionality is available) or in the Web front end. c) If the teacher chooses the "one at a time" option, when an activity is revealed, show the next activity d) Show list of links to activities in which the user is currently participating
Register	a) User can register to take part in a course b) Teacher can choose to make the entire course public c) Show list of links to courses for which the user has registered

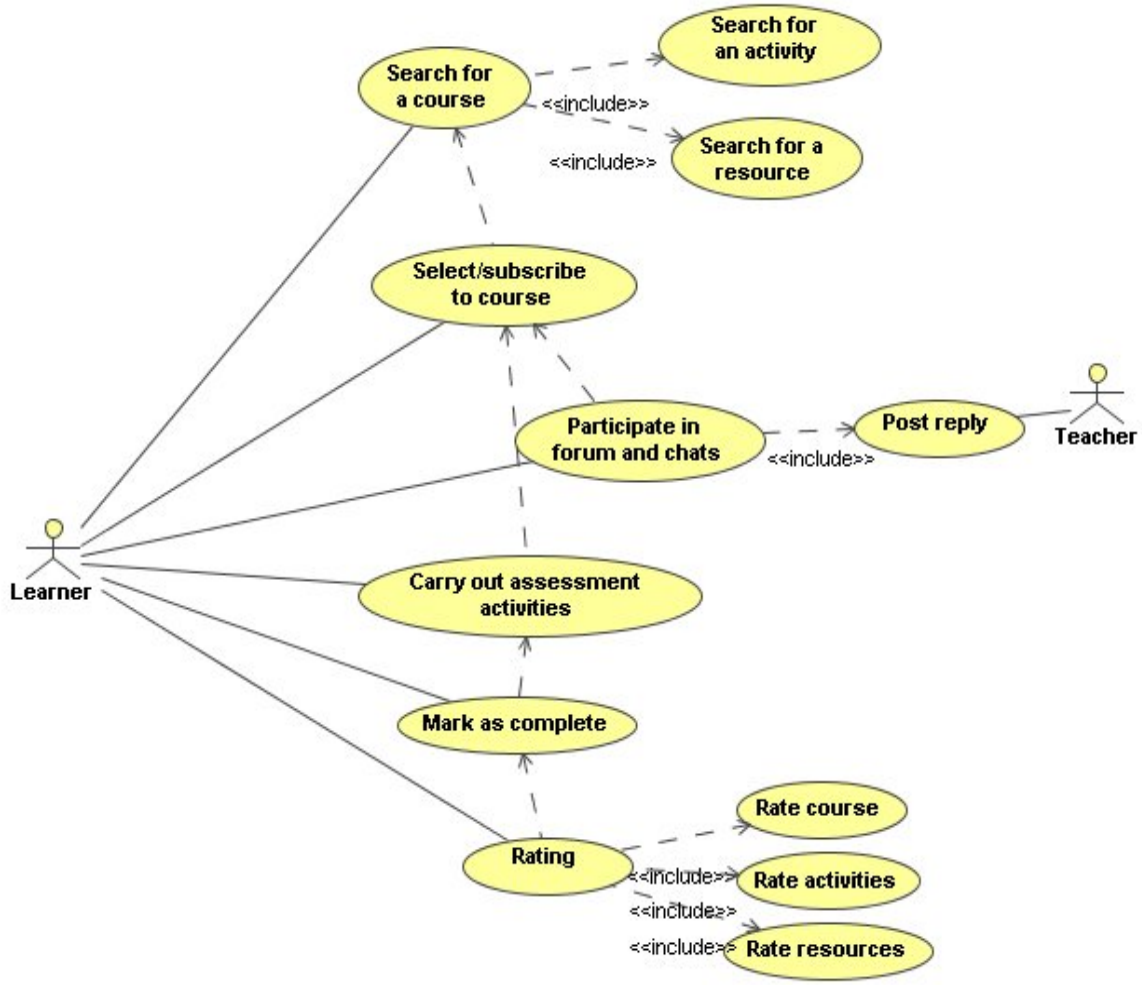
4.1.3 Importance of PCM elements in this usage profile

	create	search	View ratings	rate	Share	forum	People / Chat	Element description	Mark as complete	Proficiency level of learner	Proficiency level / difficulty of element*	Direct accessible**	Concept / label
Community	--	++	--	--	--	--	--	--	--	--	--	--	-
Competence profile	-	++	--	-	--	--	--	--	-	++	++	++	Goals
Competence	-	++	--	-	--	--	--	--	++	++	++	--	Learning objectives
Course (=Competence development plan)	--	++	++	++	--	++	++	--	++	++	++	++	Course
Action	++	+-	+-	+-	++	++	++	++	++	--	++	+-	Activity
Resource	++	+-	+-	+-	++	++	++	++	++	--	++	+-	Resource

* = the difficulty level of the element in relation to the proficiency level of the learner, which should enable the learner to select elements that match their current proficiency level

** indicates whether the element should be directly accessible = searchable as opposed to only being accessible through the element one step higher in the hierarchy

4.1.4 Use case diagram



4.2 Usage Profile "Create Course"

In this usage profile a course is created. The usage profile described depends on the ReCourse editor, CopperCore and the Widget services, the last two being loosely coupled to the PCM (please note: alternatively in line with the usage profile “Follow Course” a course can be created directly in the PCM without using the ReCourse editor and CopperCore and Widget services). For this usage profile we will discuss three connected steps ‘Authoring a UOL’, ‘Publishing a UOL’ and ‘Using a UOL’.

4.2.1 Authoring a UOL

Actors: Learning Designer

Typical context
Gwyneth is a learning designer at an institute which offers courses in Safety at Work. She would like to create a course which her institute can offer through the TENCompetence infrastructure. She already has a clear idea of how the course should be structured. She is aware of the structure of the IMS LD specification, and of the services available in ReCourse in addition to UOL editing (test editor, chat, forum). She plans to use a test to provide a simple self assessment which users can use to assess their knowledge of Safety at Work. If they get a high score they are invited to skip the introductory unit. She also wants the learners to be able to contact each other to exchange their thoughts and ideas, and so she decides to include a forum and an instant messenger service her course.

Workflow
Using the ReCourse editor she:

1. Opens the ReCourse editor.
2. Creates a local folder and saves her empty UOL there with the name "Safety at Work".
3. Creates and imports the resources she needs.
4. Creates the roles, activities and environments which make up UOL.
5. Launches the "tests and questionnaires" editor and creates a simple test, which she includes as a resource in an environment
6. Adds a forum and a chat to an environment in her UOL.
7. Saves her UOL and closes the ReCourse application.
8. Adds a description of the course to the list of available courses on her Institute's website.
9. She logs on to the PCM, and adds a link to the course as part of a competence development plan for the "Safety Officer" competence profile.
10. For safety, she also saves her UOL onto a repository, following a link provided in her copy of ReCourse.

Core functionality required to support this workflow

1. ReCourse editor

    - Saves UOLs compliant with IMS LD level A
    - Has a "test and questionnaire" plug-in
    - Has an integrated publishing mechanism
    - Has a means to include chat and forum services in the UOL
    - Can represent the chat and widget services, and the QTI tests, in a way which can be interpreted by the runtime system
    - Has a configurable link to a specific instance of a repository, and can interact with the API of the repository to obtain information about the UOLs held there.

2. A running repository (the current assumption is that this will be OpenDocument)
3. A running SLeD server, with a QTI runtime system integrated (presumably the current integration APIS)
4. A running CopperCore server

4.2.2 Publishing a UOL

Actors: Learning Designer or Teacher

Typical context
After a month the institute has received six emails asking to participate in the course. The course coordinator, Nicole, has arranged with the participants that the course will start on the first day of the next month. The day before the course is due to start, Nicole sets up the system so that learners and the teacher can log on.

Workflow: Nicole:

1. Launches ReCourse
2. Looks for the "Safety at Work" UOL. She follows the link provided to the repository, and searches the UOLs available there.
3. From inside ReCourse, and without having to download the UOLs, she browses to see who authored them, and what their learning objectives are.
4. Locates Gwyneth's "Safety at Work" UOL, and downloads it to her local folder
5. Opens "Safety at Work" in ReCourse.
6. Clicks the "Publish" button
7. Enters the names and email addresses of the participants in a dialog box and clicks "OK".
8. Some minutes later she receives a message to her email account in which she is given

    - a link to the run of the UOL
    - password for the run of the UOL
    - a list of the participants who have been sent usernames and passwords.

Core functionality required to support this workflow

1. Link between ReCourse and repository which enables users to browse the UOLs available there and inspect information made available by parsing the XML of the UOL
2. Interface for publishing UOL implemented in ReCourse
3. Interface for entering names and emails of course participants implemented in ReCourse
4. Link with CopperCore server implemented, enabling ReCourse to populate and publish a UOL

4.2.3 Using a UOL at runtime

Actors: Teachers and Learners
The participants in the course (teacher and learners) start using the course. They:

1. receive a message in their email account providing them with a link to the course, username and password.
2. click the link provided in the message
3. click a "log in" button on the course front page
4. are given access to the course and are led through the activities according their roles and the flow defined in the UOL.
5. The self assessment test and the forum and chat services made available as required

Actors: Learners only

1. When the learners have finished the Unit of Learning they log on to the PCM and mark the "Safety at Work" course as being completed.

Core functionality required to support this workflow

1. CopperCore server maintained
2. SLeD server maintained
3. Version of APIS integrated with the SLeD server which meets requirements of Test author
4. Widget server maintained
5. Forum widget available
6. Chat widget available

4.3 Usage profile "Personal Development plan"

4.3.1 Description

In this usage profile, the PCM is used for working with their Personal Competence Development Plan, which means creating the plan, following it, and

reflecting on the progress. The PCM is a personal environment, completely owned by the user. Learning from other learners within the PCM is not a relevant issue, however the plan can be shared with others. The current functions that you can base your plan on the plan of others should be hidden as an advanced option

4.3.2 Most important activities in this usage profile + related actions

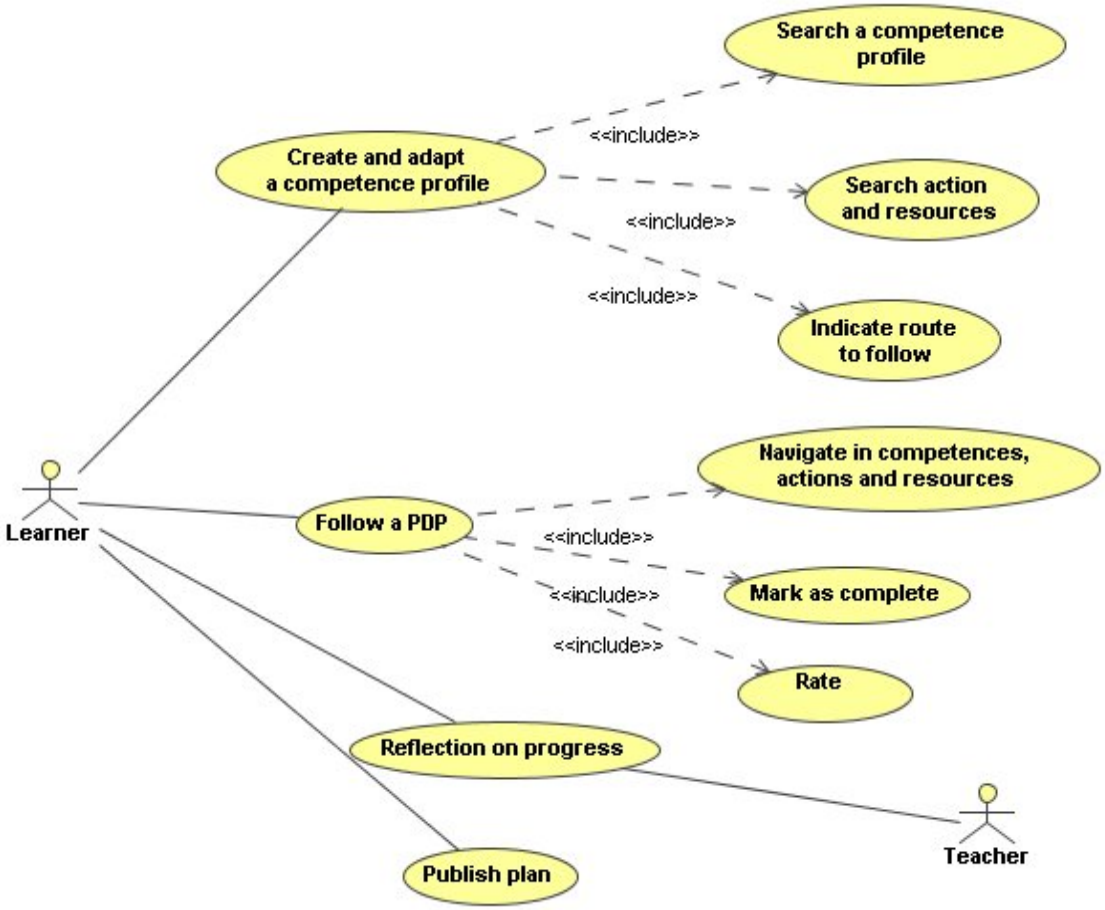
activity	**Related actions**
Create and adapt a PDP	Create a competence profile and its competences, based on competence profiles that are available into the system. This requires that the system contains many different competence profiles for many different jobs/functions. The profile that is found can be adapted by the person to match his/her needs. He can also define a profile from scratch (e.g., by entering one from paper or the Internet). Create actions for formal and informal learning. This can be based on a search for existing actions and resources that match the learners interest and the learners proficiency level Combine actions and resources into a personal PDP, indicating the route to follow
Follow a PDP	Navigate easily from competence profile and competences to actions and resources Mark especially actions and resources as complete
Reflection on progress within PDP	Get an overview of the actions and resources that have been done and the route that has been followed ánd the actions and resources that have to be done yet. Get an overview of current proficiency level
Discuss progress with tutor or employer	Same as reflection + make agreements on how to progress
Publish plan	Make it public for everyone at the Internet, add some general comments for the readers of the plan.
Collaborate on Plan	Define a group of people who can collaborate to create and follow the plan
View plan	Define one or more persons who can view the plan (but not edit)

4.3.3 Importance of PCM elements in this usage profile

	create	search	View ratings	rate	Share	forum	People / Chat	Element description	Mark as complete	Proficiency level of learner	Proficiency level / difficulty of element*	Direct accessible**	Concept / label
Community	--	--	--	--	--	--	--	--	--	--	--	--	-
Competence profile	-	++	++	-	++	--	--	++	-	++	++	++	Competence profile
Competence	-	++	++	-	+	--	--	++	+-	++	++	--	Competence
Competence development plan	++	+-	+	-	++	--	--	++	+-	--	++	--	Personal development plan
Action	-	++	++	-	--	--	--	++	++	--	++	++	Action
Resource	-	++	++	-	--	--	--	++	++	--	++	+	Resource

* = the difficulty level of the element in relation to the proficiency level of the learner, which should enable the learner to select elements that match their current proficiency level ** indicates whether the element should be directly accessible = searchable as opposed to only being accessible through the element one step higher in the hierarchy

4.3.4 Use case diagram



4.4 Usage Profile "Knowledge Management"

This profile is directed at setting up communities to share knowledge about various topics. The resources and discussions about the resources are at the centre, organised per topic and in knowledge areas (better terms can be selected). So important functions are (between brackets the current name)

- Topic Areas ("Competence Profiles")
- Topics ("competences")
- Search topics and topic areas
- Folders to group topics (idem)
- Resources (files and Internet links to services or objects)
- Rating of resources
- Forum to discuss topics
- Forum to discuss the overall issues (and write summaries, etc.)
- Synchronous functions to discuss (chat, Skype, etc.)

Use Case 1: directors of libraries want to share knowledge about youth libraries

The directors of the Dutch public libraries want to share their knowledge and views about the topic "youth library". Younger people are not using the library anymore and the directors want to discuss why this is, share research findings about these topics and want to come up with solutions. This all using the PCM.

Use Case 2: A person wants to collect information about a certain topic with his peers in order to write a report about it

John wants to write a report about the effect of Web 2.0 on the infrastructure of their university. He asks colleagues to share and discuss information with him using the PCM.

4.4.1 Most important activities in this usage profile + related actions

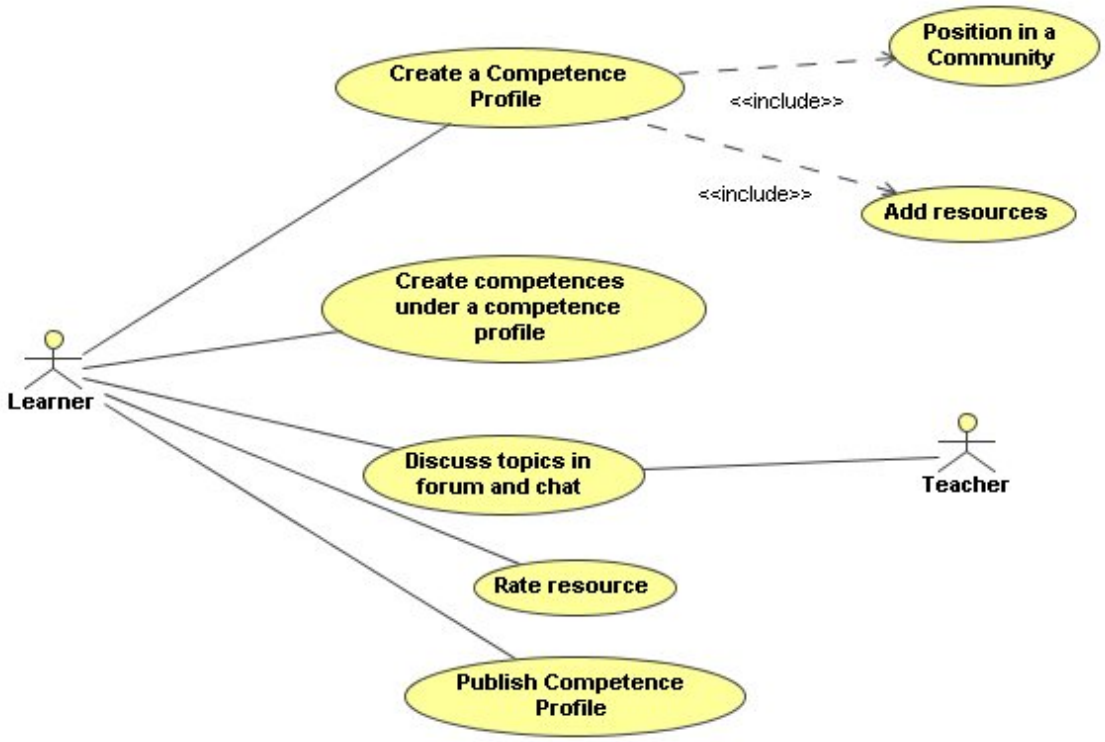
activity	Related actions
Create a topic area	Type the topic area (another name for 'competence profile'). This topic area is automatically positioned in a community with the same name (the person doesn't have to be aware about this).
Fill the topic area with resources	You should be able to easily drag and drop resources from your desktop to the resource pane. The name of the original document is its initial name. By right clicking you can rename it. Add some additional meta-data like comments or a description when desired.
Create topics under the topic area	Get an overview of the actions and resources that have been done and the route that has been followed ánd the actions and resources that have to be done yet. Get an overview of current proficiency level
Regroup the resources to different topics	Same as reflection + make agreements on how to progress
Discuss topics	Using asynchronous forums and synchronous tools (Chat, Skype, etc.)
Write conclusions	Using some overall forums (or a link to services like Google docs): write conclusions.
Rate resources	Rating for each resources
Search topic areas or topics	When somebody wants to know something about youth library, he should be able to discover the community. Furthermore he should be able to find topics within the community.
Publish topic area	Make it public for everyone who can access the Internet
Collaborate topic area - viewers - collaborators	The community can be a restricted group of people. You can set writes to specific persons to change information or to only read information.

4.4.2 Importance of PCM elements in this usage profile

	create	search	View ratings	rate	Share	forum	People / Chat	Element description	Mark as complete	Proficiency level of learner	Proficiency level / difficulty of element*	Direct accessible**	Concept / label
Community	--	--	--	--	--	--	--	--	--	--	--	--	-
Competence profile	++	++	++	-	++	++	++	++	--	--	--	++	Topic Area
Competence	++	++	++	-	++	++	++	++	--	--	--	++	Topic
Competence develop plan	--	--	--	--	--	--	--	--	--	--	--	--	"invisible"
Action	--	--	--	--	--	--	--	--	--	--	--	--	"invisible"
Resource	++	++	++	++	++	++	++	++	--	--	--	++	Resource

- = the difficulty level of the element in relation to the proficiency level of the learner, which should enable the learner to select elements that match their current proficiency level
- ** indicates whether the element should be directly accessible = searchable as opposed to only being accessible through the element one step higher in the hierarchy

4.4.3 Use case diagram



4.5 Usage Profile "Overview" (exploring resources, persons and competence profiles)

4.5.1 Use Case 1: Connecting with relevant peers in the network community

Marc is looking for an international Master degree in finance. He has read a lot of information online about different programmes. He has also realized that despite the power of search tools like Google, he has a hard time finding interesting and alternative pathways (e.g. MBA, programme in foreign countries, part time options, dividing the programme between two cities, scholarships, etc). He would like to connect with other people who have similar objectives or who are already finance experts in order to exchange ideas about the best career path.

Actors: Learners and experts

Primary Actors: Learner

Flow of Events

Basic Flow

1. Marc inputs his profile information including his Finance competence objective.
2. Marc browses the network of Competence Development Opportunities (CDOs) related to Finance.
3. Marc selects a book about international post-graduate Finance studies.
4. Marc reads the book and narrows down his choices to two or three Masters programmes in Finance.
5. Marc wants to connect with relevant people. He posts a message in a forum to ask if anyone has attended these programmes.
6. Marc receives a response from John who suggests that he should consider an MBA specializing in Finance and recommends that he read the book « Selecting your MBA ».
7. Marc looks at John’s profile.
8. Marc uses the User Network Map to see who is in John’s personal network (contact and buddy lists).
9. Marc finds the book very relevant and eventually adds John to his personal network.
10. Later when browsing the CDOs related to finance studies Marc realizes that this book is missing and decides to add it himself.
11. Marc tags the book with the competences « finance » and « MBA ».

4.5.1.1 Most important activities in Use Case 1 + related actions

Activity	Related Actions
Describing oneself (‘creating and editing my user profile’)	a) Create profile
Browsing knowledge networks	a) Browse the network of CDOs related to competence Finance, not all are MBA, needs to look for both characteristics b) Select a CDO
Engaging (adding peers to one’s network)	a) Add another user to his contact list
Describing, discussing and debating (knowledge exchange facilities)	a) Create a thread on the associated forum of this CDO b) Assigns a tag to a CDO – MBA and Finance
Manipulating the repository (basic object manipulation features)	a) Create a CDO - adds book “Selecting your MBA” when he realizes it is NOT there

4.5.1.2 Importance of PCM elements in Use case 1

Services/Functions	Create	Read	Update	Search	Share	Register
User	++	++	++	++	--	++
Community	--	++	--	++	--	--
Competence Profile	--	++	--	++	--	--
Competence	--	++	--	++	--	--
Competence Development Plan (Course)	--	--	--	--	--	--
Resource	++	++	--	++	--	--
Learning Activity	--	--	--	--	--	--
Assessment Activity	--	--	--	--	--	--
Assessment Item	--	--	--	--	--	--

4.5.1.3 Auxiliary Services

Forum	++	++	++	++	++	--
Message	++	++	++	--	++	--
Chat	--	--	--	--	--	--
Rating	--	--	--	--	--	--
TENC Server Discovery (central repository)	--	--	--	--	--	--

4.5.2 *Use Case 2: Connecting to competence networks through video-enhanced navigation and game dynamics*

Marc (from Use Case 1) after having attended and completed successfully an MBA Programme decides to explore the features of the TENCompetence system, gradually discovering and taking advantage of an innovative, video-based approach of sharing competence-related knowledge and Competence Development Opportunities (CDOs) based on advanced recommendations and engaging game dynamics.

Actors: Learners and experts

Primary Actors: Learner

Basic Flow

1. *Marc browses* the network of Competence Development Opportunities (CDOs) by searching for the keywords “MBA” and “Career”
2. Marc identifies in the search results a number of videos (i.e. generic competence-related videos, CDO-related videos and videos submitted by Competence Development Experts) and select one of them
3. Marc rates the video he has selected
4. Marc wants to share his personal experience about his MBA and career development, and decides to post a video response to the video he has selected
5. Marc uses the Network Visualization and Navigation Tool to discover people’s profile behind the videos and comments
6. Marc looks at Karen’s profile
7. Marc wants to connect with Karen and send her a message to ask for advices on career after an MBA
8. Marc is invited by Karen to participate in a brief game session with few other participants on the subject “Managing your career after an MBA”
9. Marc starts the game and views – during the game – a video made by an Expert on the subject “How to manage your next career step after an MBA”
10. At the end of the game, Mark accepts to remove anonymity and gets to meet Andrew who has just finished an MBA Programme
11. Marc engages a discussion with Andrew in the chat and adds him to his buddy list

4.5.2.1 Most important activities in Use case 2 + related actions

Activity	Related Actions
Describing oneself (‘creating and editing my user profile’)	a) Edit profile
Browsing knowledge networks	a) Browse the network of CDOs related to the keywords “MBA” and “Career” b) Select matching knowledge resources (i.e. videos) c) Rate the knowledge resource (i.e. videos)
Engaging (connection games, adding peers to one’s network)	a) Play a game with a peer b) Add a user to the contact list
Describing, discussing and debating (knowledge exchange facilities)	a) Send a message to a peer b) Chat with a peer
Manipulating the repository (basic object manipulation features)	a) Create a knowledge resource - add a video

4.5.2.2 Importance of PCM elements in Use case 2

Services/Functions	Create	Read	Update	Search	Share	Register
User	--	++	--	++	--	--
Community	--	++	--	++	--	++
Competence Profile	--	++	--	++	--	--
Competence	--	++	--	++	--	--
Competence Development Plan (Course)	--	--	--	--	--	--
Resource	++	++	--	++	++	++
Learning Activity	--	--	--	--	--	--
Assessment Activity	--	--	--	--	--	--
Assessment Item	--	--	--	--	--	--

4.5.2.3 Auxiliary Services

Forum	++	++	++	++	++	--
Message	++	++	++	--	--	++
Chat	++	++	++	--	++	++
Rating	++	++	--	--	--	--
TENC Server Discovery (central repository)	--	--	--	--	--	--

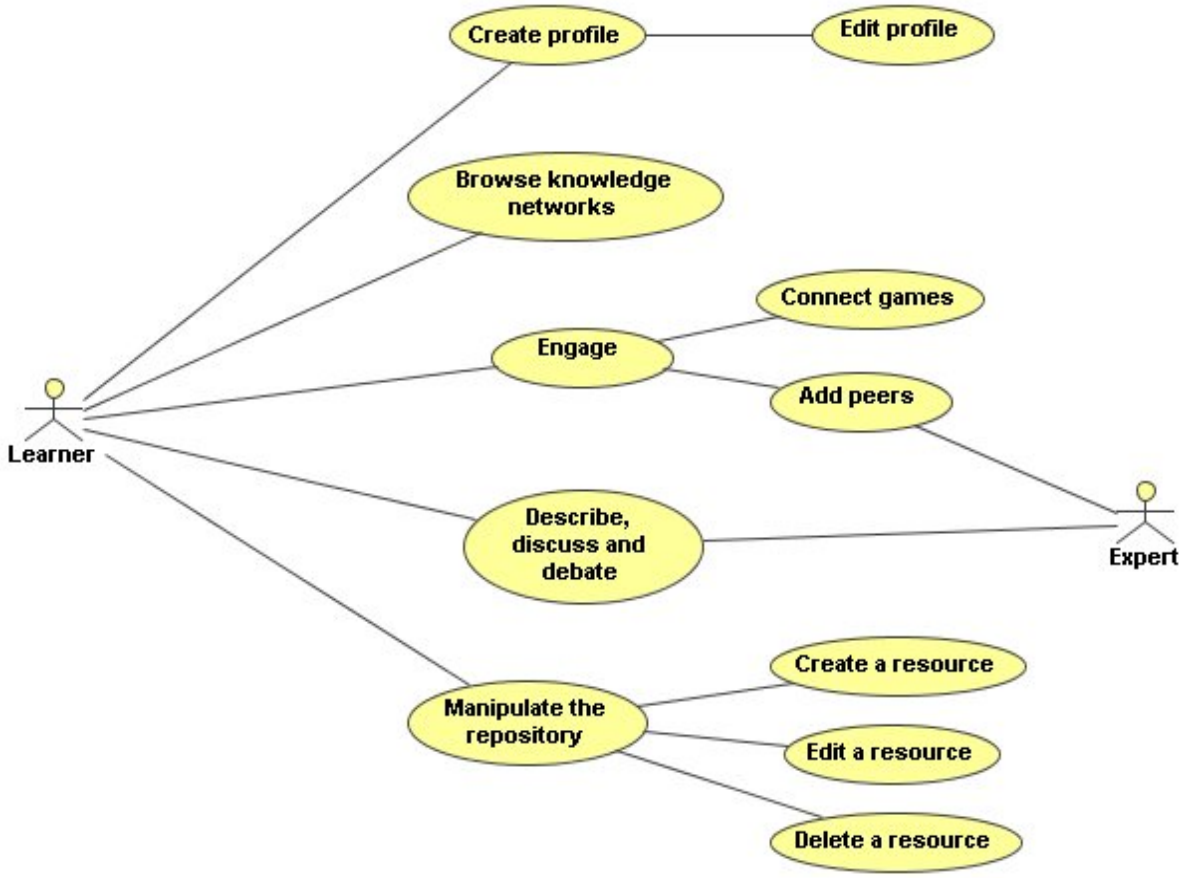
4.5.3 Importance of PCM elements in use case 1 AND use case 2

Services/Functions	Create	Read	Update	Search	Share	Register
User	++	++	++	++	--	++
Community	--	++	--	++	--	++
Competence Profile	--	++	--	++	--	--
Competence	--	++	--	++	--	--
Competence Development Plan (Course)	--	--	--	--	--	--
Resource	++	++	--	++	++	++
Learning Activity	--	--	--	--	--	--
Assessment Activity	--	--	--	--	--	--
Assessment Item	--	--	--	--	--	--

4.5.4 Auxiliary Services

Forum	++	++	++	++	++	--
Message	++	++	++	--	++	++
Chat	++	++	++	--	++	++
Rating	++	++	--	--	--	--
TENC Server Discovery (central repository)	--	--	--	--	--	--

4.5.5 Use case diagram



Appendix I. Vision Group Meeting Minutes 5-10-2006

Date of Meeting	5-10-2006	**Place of Meeting**	Crete

Attendants	Rob Koper, Dai Griffiths, Judith Schoonenboom, Albert Angehrn, Eric Kluijfhout, Peter van Rosmalen. Demetrios Sampson (excused)
Topics:	Project Vision / communication strategy

Rob introduced the need to come a shared vision how to present the project to the outside world. The result should be used:

- to steer the review, it should crystal clear communicate the ideas behind our project and it should be used as away to steer all presentations inline with and contributing to this vision
- to guide the communication to (potential) associate partners, users and the public in general.

As a start, the focus of the discussion was predominantly on trying to identify the **unique selling points** of TENCompetence. In addition the question was raised to come to an appealing **name** of our system and some **questions** following from the unique selling points.

Finally, at the end of the meeting the need was identified to follow this session up not only in this group but also as an activity. Therefore in the new DIP in WP2 a task will be included.

1. Unique selling point(s)

Our perspective is a (knowledge) society with people who care about themselves and take their own responsibility to develop themselves in other words: personal competence development. The system will be enabling this attitude. Everyone will be managing their competence development as an individual, responsible entrepreneur. Note, we do not take the responsibility to create this attitude. This is outside our scope.

Our **plus**		All (including us)
Central: Personal Competence Development		
Self controlled (innovators)		Controlled programmes (market followers)
Bottom up (unique, social space)		Top down
Personal employability, personal enrichment & personal fulfilment in other words empowered self driven individuals		
Business case: 'Elite case' e.g. Shell engineers		Common case
Flexibility of choice: bringing together (transparently) various programmes		

Some notes:

- TENCompetence does not cover the organizational perspective. And this is not necessary an organization can add it themselves;

- We should not forget that also for lifelong learning there always will be a need for formal education e.g. for safety issues, environmental issues;

- we should look into trends in competence development

2. Name

Once we have our first release it is important to have an appealing name. It should reflect the central perspective of Personal Competence Development.

(**E**mploy **Y**our Self = EYeS)

3. Questions:

- Why behave users as they do?
- Do user demands fit with our system?
- Do we have requirements for LN-communities regarding size or context?

Appendix II. Vision Group Meeting Minutes 20-06-2007

Date of Meeting 20-06-2007 **Place of Meeting** Barcelona

Attendants Albert Angehrn (INSEAD),
David Griffiths (University of Bolton),
Judith Schoonenboom (UvA),
Rob Koper (OUNL, chair),
Peter van Rosmalen (OUNL, secretary)

Topics

1. Feedback on Bolton and Italy sessions. Focus in Bolton was WP5. A follow-up was given in Italy, Dai and Albert reported that ILABS was very open to take up suggestions. Concern about take-up of taxonomy proposed. Note: this should be scheduled in a plenary meeting.

2. WP4. Pilot challenges. Two critical issues are identified (1) the number of participants (2) the match with the TENC philosophy. All official pilots have a risk to be too small and to be too traditional. There is a clear need for a pilot that fits the objectives and examples (see also 4) that demonstrate the intrinsic value of the PCM.

3. WP8. User-profiles for experimentation are required. Options: INSEAD alumni community, City of Antwerp, game-communities; employment offices, winter school participants, TENCompetence competence wp9 profiles. Requirements: size of the community; online; with elaborate profiles; activities between members.

4. Launch of PCM. Different perspective of use (roles) should be explored to show the possibilities. It may require different gui-implementations and additional functionality. This is ok if it includes less functionality but will (at the moment) not be possible if it requires more functionality as available. Note: to stimulate the usage of the PCM it is important to have a set of showcases available.

   Examples:

   - beginner vs. advanced

   - PDP
   - personal learning management system
   - community of practice

- 'social' help system
- competence assessment:
    i. organization perspective find the right person (cross sector or for the right team)
    ii. self-assessment
- organizing / finding learning materials

- learn for a new job
- learn for a new function (acquire new competences)

The examples have to be communicated with WP2, WP3 and WP9 to organize the follow-up required for the launch and/or to define new functionality.

5. Role of WP2-vision group extended:
    - authorize wp2-task 1 output (in particular roadmap & setting of priorities)
    - identify gaps
    - give high-level use cases as input for further elaboration

6. The vision group should stimulate the activities. It should not be an elite group. Therefore it is important to look at the fit with the overall TENCompetence team:
    - Communicate and discuss in plenary follow-up session
    - Invite additional project members session wise
    - Session: partly closed, partly open

Appendix III. Vision Group Meeting Minutes 16-10-2007

Date of Meeting	16-10-2007	**Place of Meeting**	Dagstuhl, Germany

Attendants	Rob Koper, Dai Griffiths, Judith Schoonenboom, Eric Kluijfhout
Topics:	Analysis Usage profiles

The usage profiling in the morning has so far been a good exercise. It is however not clear what will happen when the present three profiles will be extended to 7/8. The present concepts used in the PCM should also be re-labelled according to usage profile. Next step is the development of the interface design.

Instead of starting from the community perspective, most users are more familiar with starting from a personal perspective: I produce something, and then I may want to share it with others. This should still be added.

The PCM will require a 'top page' or 'home page' that will introduce the user to the various usage profiles, which can then be accessed.

The PCM is mainly a contextualising tool, focussing on competence management. Therefore we should not concentrate on the course component too much (there are already enough VLE's out there).

There is a danger, with 'simplifying' the usage profiles, that they may have an exiting interface but boring functionality! This is a challenge in designing the usage profiles and their user interfaces.

The PDP usage scenario is the most interesting and the core of the project. Other services required in support of this should be based on existing web 2.0 tools as much as possible.

The core of WP6 is clear: create course, follow course, and competence assessment.

The core of WP7 should be 'the best next step' issue

The e-portfolio usage profile and the competence assessment profile are closely related, and should possibly be developed in conjunction.

The PCM services as produced by WP3 are the main project outcomes. On top of these you can develop various client types, which may even depend for example on the needs of an individual pilot! In fact the implementation of usage profiles and related clients can be seen as a 'proof-of-concept' and validation mechanism for the PCM services.

Questions remaining for Wednesday:

- E-portfolio by WP7 and competence assessment by WP6? Coordination between the two required?
- PDP scenario to fall under WP7?
- What about WP5 and WP8: join the WPs, join activities only; .....
- Who should become responsible for profile designs: the aspect WPs or WP2?
- Who should develop the web-clients after the 'repair period': aspect WPs or WP3? Or a mix, with WP3 senior staff coordinating work in the aspect WPs?
- How to address the dilemma that 1) we are behind with software delivery, and 2) now want to develop both RCP and web-clients?
- Waterfall method: first RCP clients and only then web-clients?
- Or only build one client type per user profile. Base decision on number of criteria: main user characteristics (web-user or experienced 'power user'); how much effort has already been invested; how easy to develop a client type; .....
- Will the aspect WPs also develop additional PCM services when absolutely necessary for their usage profiles (e.g. e-portfolio, competence assessment, ...) , or will this be done by WP3?

Should WP2 also get a coordinating role not only in vision/direction, but also in overall monitoring of project outcomes (whether they conform to the vision/direction)?

Appendix IV. Roadmap for software development in TENCompetence

Authors: Rob Koper, Dai Griffiths, Judith Schoonenboom, Eric Kluijfhout

Version	*Date and Comments*
1.0 / October 2, 2007	The report of the Dagstuhl event
2.0 / November 1, 2007	Adapted after the TENCompetence Meetings in Maastricht
2.1 / November 4, 2007	Small correction: add graphical design group work of Ayman & Linda & added some more explanation of the relationship of the clients with the PCM 1.0 services.

Also see the slides that are presented at the TENC meetings in Maastricht.

1. Introduction

This document is the result of the discussion we had in Dagstuhl, September 2007, and the TENCompetence Meetings we had in Maastricht, 15-17 October 2007 about the future development of the software developed in the TENCompetence. The conclusions were based on a SWOT analysis and Usability Issues with the PCM. We identified that the major strength of the project at the moment is that we managed to create an integrated system, the PCM. It is a good proof of concept, it has lots of functionality: even much more than you would expect from the tool at this stage. When we manage to put this functionality, with some additions and further refinement, into real practice in various domains of associated partners, we will have accomplished a good job. Some weak points that we have identified are: too many fragmented activities, too many delays in the various programming and testing activities, and too little focus of the various teams on the integration activities that are the core of the TENCompetence project. In this document you will find the following information:

a. A summary of the Analysis

b. The general measures we identified

c. Short term repair activities

d. Overall strategy for the work in the Aspect work packages and the integration with WP3 work

2. Analysis of the issues that are responsible for delays in the project

We identified the following issues in the project that are responsible for the delays in software development. The reasons and proposed measures are summarized in the following categories:

1. Staffing Issues:
Make it easier for non experienced programmers in the partnership (and outside!) to contribute.

2. Too much work:

Make it easier to integrate existing tools that we need, but are not core to the project (like chat, forum, etc. services).

3. Lack of Common Ground:
a) Identify the basic issues where common ground is lacking: this is a technical as well as a vision issue (lifelong competence development).
b) Create attractive training environments that make it very clear (by maximizing cognitive dissonance through questioning) were the discrepancies are.

4. World has changed:
a) We have to focus as soon as possible on the development of Web clients based on Web 2.0 principles, using AJAX.
b) We should rethink the way communities are created. People tend to start work on their own 'product' (a 'my space' perspective) and from that point onwards they share and publish to create a community around it. Currently we are starting from the communities' perspective.
c) We should focus more on the ePortfolio perspective (including identity and personal profile). Currently the portfolio data are available and an ePortfolio can be made with the system (the system itself is a kind of ePortfolio system), but this is not evident for the user, and the user is not helped to do so. In fact the user is hampered to do so because s/he cannot copy information from one community to another (the portfolio is currently modelled by using a personal community with only your own competence profiles you have mastered).

5. Collaboration issues:
a) People in the different WPs should collaborate more. With the exception of WP3, the other teams do not have fixed weekly online meetings scheduled in which they discuss their joint tasks and work. This should be changed from now on. Teams should work on the same agenda collaboratively. As a result under DIP-3 people should be assigned to project tasks on the basis of their competences rather than on the basis of organizational affiliation.
b) Aspect WPs have fragmented knowledge of what is going on in WP3: each team should look at the PCM client and services in detail, because this is of importance for demarcating the functionalities between the different WPs and the integration of their future work.
c) More focus needed in the tasks (make a distinction between core tasks and additional tasks: focus primarily on the core tasks. This will be explained later in more detail in this text).
d) Currently it is hard for new people to join existing teams. Better mechanisms should be provided by WP9 to train and introduce new persons.
e) Sometimes it is hard to monitor progress and sometimes it is not clear who makes the decisions about directions. In DIP-2 we made a fundamental change in the setup of WP2. The mechanism is that the vision group of WP2 is responsible for decisions about the future course. This is also the reason that this group has led the Dagstuhl session and created this document.

6. Production issues
a) Existing OS software is either not available or more difficult to integrate than we expected in the original project plan. This means that we have to create some of these software ourselves which we did not plan for. An example is the QTI tools. This is a fact of life. We have to cope with this by concentrating on the core of TENCompetence and find a way to include existing web services (forums, chats, etc.) as much as possible that are not directly related to our core of our work on lifelong competence development.
b) We have too much work defined in the different WP tasks: much more focus is required (see section 3.III)

c) The integration of the programming work of the Aspect Work Packages with the work done in WP3 should be revised. Currently the Aspect WPs do not deliver workable and tested components to be integrated in WP3. The integration model should be further clarified and executed.

Keywords to overcome these software related issues are: more focus, more collaborations, increased usability and the involvement of end-users in the further development of requirements and software. For the evaluation in WP4: increase scale, volume and involvement of pilot partners. For WP9 support usability by providing training means, increase training. WP10: work out concrete plans to collaborate with the various associated partners that are now connected to TENCompetence.

Furthermore we will concentrate on the further development of:
- web clients based on the PCM services
- a graphical design/framework for the web clients (and RCP) to create a common look and feel for the different applications

3. Strategy

We decided to take the following measures based on the SWOT analysis:

1. WP3 will perform some short term "repair actions" to increase the usability of the PCM and to add some small changes. The release of this repaired version (version 1.0 of the PCM) is planned for December 2007.
2. After the delivery of the PCM 1.0 in December 2007, WP3 will concentrate on the further elaboration of the PCM Web Services and the frequent releases of the integrated PCM (delivering the work of the Aspect WPs and the PCM services). The Aspect WPs will concentrate on the delivery of the PCM Clients that are working on the PCM Services.
3. When new services are required for the work of the Aspect WPs, the WPs should contact WP3 to discuss who and how these services will be developed. In general the principle will be followed that WP3 will perform the changes that are connected to the core services and the Aspect WPs will develop the services that can be seen as rather independent extensions to the current PCM services (e.g. like CopperCore, Widget Service, etc.).
4. We identified a "core" for every Aspect WP. The aspect WPs should work in a collaborative effort involving all work forces available to work on this core. The tested and usable software for the core should be delivered as soon as possible. 80% of the short term workforce should be concentrating on the delivery of the core, 20% can prepare future additional activities.
5. The work on the PCM clients will be divided in several identified "usage profiles". The aspect WPs develop the tested and usable client software for the identified usage profiles that works together with the PCM services. WP3 will test the proper technical quality and integrate the working client into a release (WP3 will not programme on the clients that come from the Aspect WPs!).
6. WP3 will also provide a technical framework for programming to create a consistent set of applications running on one set of services. All programming for the software that is planned to be released in May 2008 must be strictly based on the PCM 1.0 services: functionality should be restricted to the functions that are offered by the current PCM 1.0 services (changing the services will delay the process tremendously). The only additions to the services that have been agreed upon are: adding CopperCore Services and adding the Widget Service. After May 2008 the PCM services will be upgraded again according to a fixed set of functionalities to allow future releases and upgrades of the Usage Profile apps.
7. A separate task force has been established to create the 'house style': interaction design

and graphical design for the usage profiles. First of December the interaction design and basic graphical design will be delivered. Then it will go to a graphical designer to make the icons, detailed graphical design, etc. These graphical objects should be used by each team that works on web clients and rich clients.

8. The elaboration of the usage profiles will be based on high level use cases and descriptions provided by the vision group of WP2.
9. The usage profiles are divided into 4 high priority, short term usage profiles (see figure 1). The software for these 4 should be delivered (user tested) by the Aspect WPs before May 2008. After this delivery the Aspect WPs will concentrate on further elaboration of the usage profiles and some of them will concentrate on complete new usage profiles (see figure 2).

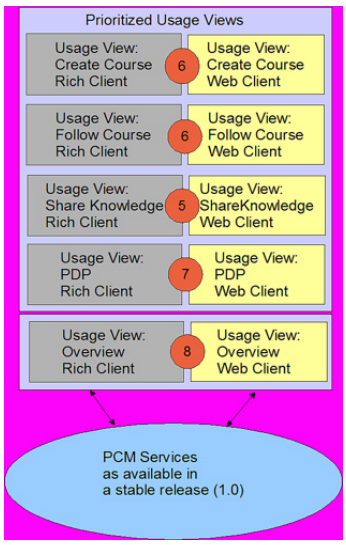


Figure 1. High Priority Usage Profiles (= Usage Views)

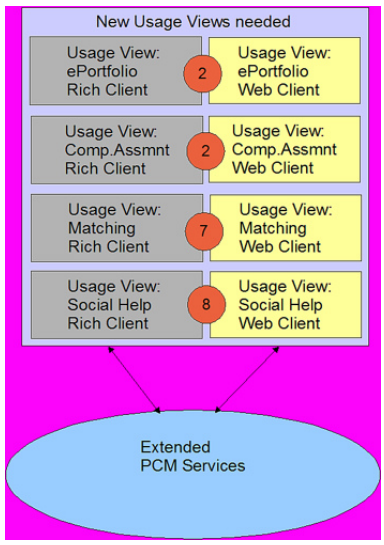


Figure 2. Extended Usage Profiles to be elaborated after May 2008 (designed from January 2008)

The assignment of work on the Usage Profiles to the different work packages is as follows:
1. WP5:
Before the review: finish of the Limewire based application.
before May 2008: Usage profile "Share Knowledge in a Community" (rich client & Web 2.0 client). An underlying problem to be solved is: how do we get file resources uploaded and accessed to/from the web.
After this period further elaborations of this usage profiles should be made. WP5 should not concentrate on hard core software development, but should concentrate on the integration of existing Web 2.0 services into a usable web based "usage profile". This "homepage" that integrates (through RSS or APIs) the underlying services is the main challenge.
Main programming work will be done by SU and ILABS (with the help of other partners).
2. WP6:
before May 2008: Usage profile(s) "create and follow LD course" by integrating visual LD editing, QTI editing, course publishing, assignment of users to runs, CopperCore, widget service, QTI service and SLED into one single, integrated and easy to use and setup system. The WP6 work is Rich client at the authoring part and Web client at the presentation part.
after May 2008: further refinement of the core when needed, further integration of the CopperCore, widget and QTI services with the other PCM services, further elaboration of

course bound assessment into the usage profile and web based (simple) authoring and deployment using web 2.0 principles.
Programming work will be done by the University of Bolton (with the help of other partners). OUNL will do the web 2.0 based version for simple authoring.
3. WP7:
before May 2008: Usage profile: "Create and Use Personal Development Plans", integrating the navigation and positioning tools that are operational and available.
after May 2008: Further elaboration of the PDP view and work on a new usage profile: "matching personal competences on job profiles in order to create personal development plans"
Main programming work will be done by OUNL (with help of other partners).
4. WP8:
before May 2008: Usage profile "overview (exploring resources, persons and competence profiles)"
after May 2008: Further elaboration of overview profile by including agents and games and social help system.
Main programming work will be done by SU with help of other partners.
5. WP2/WP3:
before May 2008 WP2 will design the usage profiles "ePortfolio" and "Competence Assessment". After they become available they will be designed technically and be programmed by WP3.
NOTE: all these client side software will work on (extended) PCM Services. In the project we have one set of services that is used for all the different applications (different usage profiles, current PCM, web clients/rich clients). This demonstrates a) that you can make various dedicated clients by bundling the same services and b) that you can work with various clients according to you needs on the same services/data.

10. The resulting set of applications can be integrated much more than we can do on the short term: for instance, the "create course" web client will be based on the PCM 1.0 services and the "create course rich client" is currently based on CopperCore (although the web client will in future deliver IMS LD code that can run through CopperCore). Another example is that the WP5 rich client that is based on Limewire. These are not at all integrated in the PCM, but will be discontinued in the future. In the future, WP5 will only provide a service that can be integrated in the RCP client developers to upload files in a secure and fast way. These integration issues have to be solved in WP3 architectural discussions starting from January 2008.
11. We will concentrate more on Web 2.0 clients using Ajax (for games we will explore whether Flash/Flex fits the requirements we have set for open source apps sufficiently: this seams to be ok!). For each usage profile a Rich Client and/or a Web Client will be available. The Web Clients have the function to be as attractive as possible to lure in new users. However, the web clients may contain the same (or even additional) functionality. The rich clients contain the more complex functionality for advanced users (see figure 3).
12. We will establish 4 programming teams:
    a) The WP3 PCM Services team (LOGICACMG, ILABS)
    b) The WP3 PCM Rich Client Platform team for the repair action and maintenance of the current PCM client (OUNL, University of Bolton)
    c) The WP5-8 Web Client teams responsible for the implementation of the web clients for the different usage profiles (SU, OUNL, FBM-UPF, University of Bolton)
    d) The WP5-8 Rich Client teams responsible for the implementation of the different rich client usage profiles (SU, University of Bolton, OUNL)
13. WP3 work on the PCM will be designed by WP2 and the integrated releases are tested in WP4. WP5-8 work will be designed, developed and tested by WP5-8 themselves. WP2 will do the functional acceptance testing, WP3 will do the technical acceptance testing and integrates it into major new releases (three per year + bug fixes).
14. Collaboration between the partners within the Aspect WPs should be increased by having weekly virtual meetings to stimulate participation, increase the tempo and synchronise the efforts.

15. Usability studies should be performed frequently (like the ones in Dagstuhl). In the original plan it was stated that we will perform frequent usability studies. Until now this is not done very frequently. The type of more informal studies we did in Dagstuhl should be repeated frequently before releasing any of the new software.

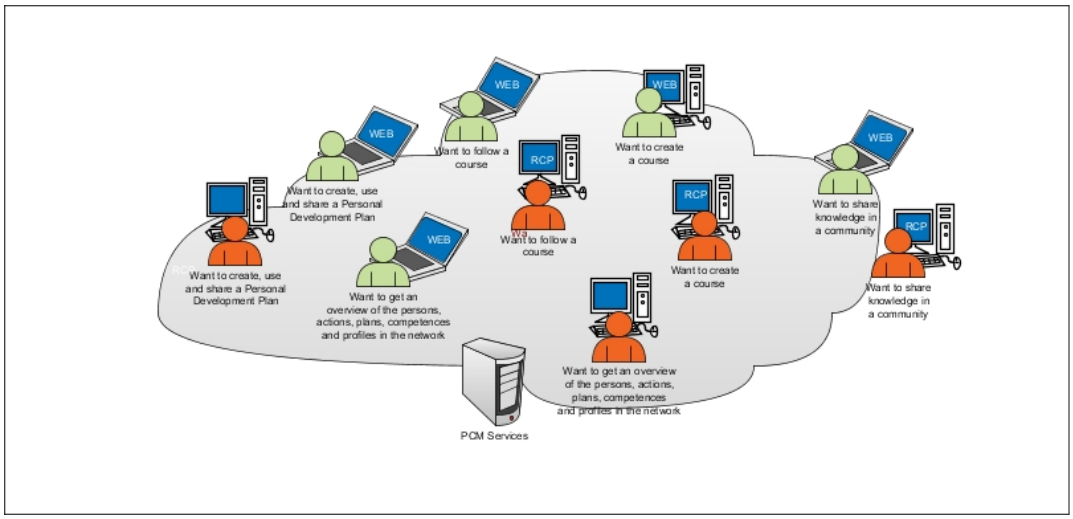


Figure 3. The six different high priority usage profiles. Users can use the web client or the rich client (RCP) depending on their preference. Each client talks to the PCM Services to provide integration of data and services independent of the client used.