Project no. 027087

TENCompetence

Building the European Network for Lifelong Competence Development

Project acronym: Integrated Project TENCompetence

Thematic Priority: 2.4.10

**M 8.1 Competence Observatory, Overview Tool, Agents, Games and Network Management**

Due date of deliverable: 01-12-2006
Actual submission date: 30-11-2006

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

INSEAD

Version 1.0

<table>
<thead>
<tr>
<th>Dissemination Level</th>
<th>PU</th>
<th>Public</th>
<th>PP</th>
<th>Restricted to other programme participants (including the Commission Services)</th>
<th>RE</th>
<th>Restricted to a group specified by the consortium (including the Commission Services)</th>
<th>CO</th>
<th>Confidential, only for members of the consortium (including the Commission Services)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PU</td>
<td>Public</td>
<td>PP</td>
<td>Restricted to other programme participants (including the Commission Services)</td>
<td>RE</td>
<td>Restricted to a group specified by the consortium (including the Commission Services)</td>
<td>CO</td>
<td>Confidential, only for members of the consortium (including the Commission Services)</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Project Milestone

## Milestone 8.1

<table>
<thead>
<tr>
<th>Workpackage</th>
<th>Workpackage 8 Networks for Lifelong Competence Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task</td>
<td>Task 8.1, Task 8.2, Task 8.3 and Task 8.4</td>
</tr>
<tr>
<td>Date of delivery</td>
<td><strong>Contactual:</strong> 01-12-2006  <strong>Actual:</strong> 30-11-2006</td>
</tr>
<tr>
<td>Code name</td>
<td>M8.1  <strong>Version:</strong> 1.0  <strong>Draft</strong>  <strong>Final</strong></td>
</tr>
<tr>
<td>Type of milestone</td>
<td>Report</td>
</tr>
<tr>
<td>Security (distribution level)</td>
<td>Consortium members / WP members</td>
</tr>
<tr>
<td>Contributors</td>
<td>INSEAD, CERTH, OUNL, UVA</td>
</tr>
<tr>
<td>Contact Person</td>
<td>Eleni Boursinou (INSEAD)</td>
</tr>
<tr>
<td>WP/Task responsible</td>
<td>Eleni Boursinou (INSEAD)</td>
</tr>
<tr>
<td>EC Project Officer</td>
<td>Hans-Juergen Westhoff</td>
</tr>
</tbody>
</table>

## Abstract (for dissemination)

This report provides the state of the art review and the design towards the definition of the TenC Competence Observatory, the Overview Tool and Stimulus Agents, as well as, the Self Organisation Tools for (a) monitoring and capturing the competences that have to be acquired in different professional and academic fields (b) pro-active sharing of knowledge and competences development opportunities within Learning Networks and (c) creating and managing a learning network, while maintaining a maximum of autonomy and control of participants.

## Keywords List

WP8, learning networks, competence, competence observatory, self-organizing communities, intelligent agents

TENCompetence Project Coordination at: Open University of the Netherlands
Valkenburgerweg 177, 6419 AT Heerlen, The Netherlands
Tel: +31 45 5762624 – Fax: +31 45 5762800
TABLE OF CONTENTS ..............................................................................................................................3

CHAPTER 1: INTRODUCTION ..............................................................................................................13
1.1 WP8 Scope and Objectives ...................................................................................................................13
1.2 Internal Structure: WP 8 Tasks ...........................................................................................................14
Task 8.1 TenC Competence Observatory ...........................................................................................14
Task 8.2 Overview Tool ........................................................................................................................15
Task 8.3 Social Agents ...........................................................................................................................15
Task 8.4 Network Management ...............................................................................................................16
Task 8.5 Roadmap ...................................................................................................................................17

CHAPTER 2: COMPETENCE OBSERVATORY ..................................................................................19
2.1 Review of Competence Models and Web-based Observatories.........................................................19
Introduction .................................................................................................................................................19

PART A: COMPETENCY MODELS .......................................................................................................22
Definition of Competency Models ..............................................................................................................22
IMS RDCEO SPECIFICATION REVIEW ..............................................................................................25
Introduction to IMS RDCEO and IEEE RCD Specifications ..................................................................25
IMS RDCEO Information Model ...............................................................................................................25
Case Study – The Europass Language Passport .......................................................................................27
Conclusions ..................................................................................................................................................29

HR-XML SPECIFICATION REVIEW ....................................................................................................30
Introduction to HR-XML Specification .....................................................................................................30
HR-XML Information Model ....................................................................................................................31
Case Study – The Europass Language Passport .......................................................................................32
Conclusions ..................................................................................................................................................33
MAPPPING OF IMS-RDCEO AND HR-XML .................................................................34

Introduction ........................................................................................................34

Mapping of IMS RDCEO and HR-XML Elements ..........................................34

THE PROPOSED CDM FOR TENC COMPETENCE OBSERVATORY BASED ON IMS RDCEO
AND HR-XML MAPPING ...................................................................................37

CDM Information Model ..................................................................................37

Conclusions ........................................................................................................45

PART B: WEB-BASED OBSERVATORIES ..........................................................46

Definition of Web-Based Observatories ..........................................................46

EXISTING WEB-BASED OBSERVATORIES ......................................................48

The CEN/ISSS Learning Technology Standards Observatory .......................48

The IDABC Open Source Software Observatory ...........................................49

The Basic Skills Agency Observatory ...............................................................50

The European Quality Observatory .................................................................51

The Public Population Project in Genomics Observatory ..............................52

The “économie langues formation” Observatory .............................................53

The Helios Observatory ....................................................................................54

The LEONIE (Learning in Europe: Observatory on National and International Evolution) Observatory ............................................................55

The POLE (Policy Observatory for Lifelong learning and Employability) Observatory ...........................56

The PASCAL (Place Management, Social Capital and Learning Regions) Observatory .................................................................57

The Linguasphere Observatory ........................................................................58

MAIN FUNCTIONALITIES OF EXISTING WEB-BASED OBSERVATORIES ........60

Information Services ..........................................................................................61

Communication Tools .......................................................................................61

Resources Management ....................................................................................61

Comparison of Existing Web-Based Observatories .........................................62
Conclusions ..................................................................................................................................................65

TARGETED USER GROUPS ..................................................................................................................67

SCENARIOS OF USE ..........................................................................................................................68

Scenario of Use 1: Search and Download a competence related document.............................................68
Brief Description of the Scenario ..................................................................................................................68
Actors ............................................................................................................................................................68
Flow of Events ..............................................................................................................................................68
Special Requirements ....................................................................................................................................69
Preconditions ...............................................................................................................................................69
Postconditions ...............................................................................................................................................69

Scenario of Use 2: Find out the Competences for a specific Job/Function .................................................69
Brief Description of the Scenario ..................................................................................................................69
Actors ............................................................................................................................................................69
Flow of Events ..............................................................................................................................................69
Special Requirements ....................................................................................................................................70
Preconditions ...............................................................................................................................................70
Postconditions ...............................................................................................................................................70

Scenario of Use 3: Create a Competence Description and discuss it with the peers.................................70
Brief Description of the Scenario ..................................................................................................................70
Actors ............................................................................................................................................................71
Flow of Events ..............................................................................................................................................71
Special Requirements ....................................................................................................................................72
Preconditions ...............................................................................................................................................72
Postconditions ...............................................................................................................................................72

MAIN FUNCTIONALITIES ..................................................................................................................73

FUNCTIONAL AND NON-FUNCTIONAL REQUIREMENTS ................................................................75
User Categories ..............................................................................................................................................75
Functional Requirements ..........................................................................................................................75
Non-Functional Requirements ..................................................................................................................77

USE CASES ................................................................................................................................................80
Basic Use Case (extracted from unified WP2 Use Case) ............................................................................80
Detail Use Cases ..........................................................................................................................................81
Anonymous User ........................................................................................................................................81
Registered User ..........................................................................................................................................82
Administrator ..............................................................................................................................................83

TENC COMPETENCE OBSERVATORY COMPONENTS AND THEIR SPECIFICATIONS ....84
TENCOMPETENCE ARCHITECTURE REQUIREMENTS FOR INTEGRATION AT CYCLE 286

CLASS DIAGRAM .....................................................................................................................................88

EVALUATION PLAN ................................................................................................................................90

CHAPTER 3: OVERVIEW TOOL AND EMBEDDED DYNAMICS .................................................................92

3.1 STATE OF THE ART REVIEW FOR COMPETENCE DEVELOPMENT SYSTEMS AND STIMULUS AGENTS .........................................................................................................................92

3.1.1 REVIEW OF WEB PORTALS AND CURRENT METHODS FOR INFORMATION SEARCH ......................................................................................................................................................94

3.1.2 DESIGN CHALLENGES ....................................................................................................................95

3.2 REQUIREMENTS ................................................................................................................................96

3.2.1 EASY ACCESS AND NAVIGATION ................................................................................................96

3.2.2 PROVIDING INFORMATION THROUGH A COMMUNITY OF USERS ........................................97

3.2.3 MAINTENANCE ..............................................................................................................................97

3.3 COMMUNITY PORTALS FOR COMPETENCE AND PROFESSIONAL DEVELOPMENT .........................................................................................................................................................................97

3.3.1 US NAVY INTEGRATED LEARNING ENVIRONMENT ......................................................................98

3.3.2 EDUCATIONAL PORTAL.COM ......................................................................................................98

3.3.3 MICHIGAN CAREER PORTAL .........................................................................................................99

HTTP://WWW.MICHIGAN.GOV/SOM/0,1607,7-192-29940---,00.HTML .............................................99

3.3.4 HEALTHCARE WORKFORCE.ORG ..............................................................................................99

HTTP://WWW.HEALTHCAREWORKFORCE.ORG.UK/DEFAULT.ASPX .........................................99

3.3.5 THE ULTIMATE TRAINING AND EDUCATIONAL PORTAL FOR CAREER DEVELOPMENT ..................................................................................................................................................................100

HTTP://WWW.TASL.COM/ ....................................................................................................................100
3.3.6 UNIVERSITY OF LEISCESTER STUDENT PORTAL ..............................................100

3.3.7 QUINTESSENTIAL CAREERS.COM .......................................................................100

3.3.8 THE UNIVERSITY OF NORTHERN CAROLINA PROFESSIONAL DEVELOPMENT PORTAL ........................................................................................................101

3.3.9 RMIT PROFESSIONAL NETWORK DEVELOPMENT ...........................................101

3.3.10 CHEMISTRY. ORG ..............................................................................................101

3.1 THE EVOLUTION OF COMPETENCE AND KNOWLEDGE MANAGEMENT TOWARDS MORE SOCIALLY-ORIENTED SYSTEMS ...................................................................102

3.1.1 SEARCH AND VISUALIZATION OF THE SOCIAL NETWORK ..................................103

3.1.2 COLLABORATIVE FILTERING FOR PROXIMITY “INTEREST” INFORMATION ........104

3.1.3 RATING MECHANISM ..........................................................................................105

3.2 EXISTING TOOLS ....................................................................................................106

3.2.1 SOCIAL NETWORKING AND COLLABORATIVE FILTERING TOOLS .................107

3.2.1.1 FRIENDSTER (SOCIAL NETWORKING) .................................................................107

3.2.1.2 RYZE.COM (BUSINESS NETWORKING) ..............................................................107

3.2.1.3 LINKED.IN (BUSINESS NETWORKING) ...............................................................108

3.2.1.4 FOAF (MACHINE READABLE WEB PAGES) ....................................................108

3.2.1.5 MY SPACE ...........................................................................................................108

3.2.1.6 FACEBOOK .......................................................................................................109

3.3 SEARCH AND VISUALIZATION TOOLS ................................................................109

3.3.1 KARTOO ..............................................................................................................109

3.3.2 LIVEPLASMA .......................................................................................................112

3.3.3 BESTIARIO ..........................................................................................................113
3.4 RATING MECHANISM ............................................................................................................114

3.4.1 MANYWORLDS ....................................................................................................................114

3.4.2 SLASHDOT ........................................................................................................................115

3.4.3 DIGG ...................................................................................................................................116

3.5 SOCIAL BOOKMARKING .......................................................................................................117

3.5.1 DELICIOUS- SOCIAL BOOKMARKING SITE ....................................................................117

3.5.2 CONNOTEA- RESOURCE AND NEWS COMMUNITY FOR SCIENTISTS ....................117

3.5.3 NING- COMMUNITY SITE FOR CREATING AND SHARING SOCIAL APPLICATIONS ....119

3.6 INTEGRATED KNOWLEDGE AND LEARNING PORTALS ..................................................119

3.6.1 KNOWLEDGE BOARD .....................................................................................................119

3.6.2 ACADEMICI.COM- ACADEMIC SOCIAL NETWORKING AND COLLABORATION SITE 120

STIMULUS AGENTS .......................................................................................................................121

3.2 DESIGNING SOCIALLY-ENHANCED VIRTUAL COMMUNITY ENVIRONMENTS IN A  
COMPETENCE DEVELOPMENT CONTEXT ................................................................................139

1. General Design Considerations ................................................................................................139

2. Design of the CDO Overview Dimension ...............................................................................140

2.1 Designing the Overview Tool ................................................................................................140

2.2 Profiling Competence Development Opportunities .............................................................144

2.3 Visual Representations and Networks Navigation Features ..................................................148

3. Design of the People and VC Dimension ..............................................................................150

3.1 Designing the People/Community Overview Tool .................................................................150

3.2 Profiling Users .........................................................................................................................152

3.3 Relationship Networks .........................................................................................................155

4. Design of Embedded Dynamics: Stimulus Agents and Game Dynamics ..............................156

4.1 On the Role of Embedded Dynamics .....................................................................................156

4.2 “Connection” Agents: Types of Stimulus Agents ....................................................................159

4.2.1 The ‘Personal Coach’ agent ...............................................................................................159

4.2.2 The ‘Concierge’ agent .......................................................................................................159

4.2.3 The CDO Connection Agent ............................................................................................160

4.2.4 The Member Productivity Agent .......................................................................................160

4.3 Network navigation functionalities .........................................................................................161
4.3.1 Display options .................................................................................................................. 161
4.3.2 Filtering options .................................................................................................................. 161
4.3.3 Navigation design diagram .............................................................................................. 162
4.4 “Connection” Games: Types of Game-like Social Dynamics .................................................. 164
4.5 Events ....................................................................................................................................... 164
4.6 Navigation Diagram .............................................................................................................. 164
4.7 Activity Diagrams ................................................................................................................ 165

5. Considerations about Value Creation, Measurement, and Sustainability ................................. 166
5.1 Using “Connectedness” as a Value Creation Metric .............................................................. 166

6. Remarks, Next Steps and Integration Issues ........................................................................... 167

7. Prototype Testing Scenarios ..................................................................................................... 168
7.1 Initiation Process Scenario ................................................................................................... 168
7.2 Competence Development Scenario ...................................................................................... 172

CHAPTER 4: NETWORK MANAGEMENT ................................................................................... 176

Objectives .................................................................................................................................. 176
Models and methods .................................................................................................................. 176
Community ................................................................................................................................... 177
Activities and roles .................................................................................................................... 177
Participant characteristics ......................................................................................................... 179
Proximate and ultimate goals .................................................................................................... 179
Social space ............................................................................................................................... 180
Relevant theories ....................................................................................................................... 181
Community characteristics ....................................................................................................... 183
Community population .............................................................................................................. 183
Community guidelines ............................................................................................................. 185
Guidelines for fostering social space ...................................................................................... 185
Guidelines for community characteristics ............................................................................. 186
Guidelines for the community population .............................................................................. 187
Existing practices ...................................................................................................................... 187
Virtual learning communities ................................................................................................... 187
  Scholieren.com www.scholieren.com ...................................................................................... 187
  Fifth dimension www.5d.org .................................................................................................. 188
  Notschool www.notschool.net ................................................................................................. 190
  ESP network .......................................................................................................................... 191
Appendix H: Detail Description of the Registered User Use Cases ....................................................... 278

Appendix I: Detail Description of the Administrator Use Cases .......................................................... 308

Appendix J: Events ................................................................................................................................ 320

Appendix K: Activity Diagram ................................................................................................................

Appendix L: Navigation Diagram ...........................................................................................................

Appendix M Activity diagram ..................................................................................................................

Appendix N Use case diagram ..................................................................................................................

Appendix O Class diagram .......................................................................................................................
1.1 WP8 Scope and Objectives

*Networks for Lifelong Competence Development* are defined as collections of programs. Networks can be defined within a single country or institute (e.g. all the programs offered by a university or training company) or across countries and institutes. Networks are however defined in one (larger) domain of knowledge like economy, digital media, management, music, etc. In this activity we will develop models and tools to support the interoperability of formal and informal competence development programs from different providers, and from different countries. The main objectives of this activity are:

- Research and develop components to provide an integral overview of all the possible formal and informal programs that are available for the users to develop their competencies.
- Monitor and capture the competencies that have to be acquired in different professional and academic fields. The fields will be related to the pilots.
- Research and develop models and software agents to stimulate the pro-active sharing of programs and the underlying learning activities and resources among users.
- Research and develop models and tools to manage the network whilst maintaining a maximum of autonomy and control of participants.
- Experiment with, and evaluate the usability of the components for networks for lifelong competence development. Search for the best approach to rating the quality of competence programs and supporting users in identifying the most appropriate program.
- Research and develop models and methods to stimulate and organize the creation, search, use, support and quality mechanisms of networks for lifelong competence development. Identify gaps in our knowledge in this field and develop and contribute to the knowledge in the field (e.g. through academic publications).
1.2 Internal Structure: WP 8 Tasks

For WP8 the objectives listed above imply that activities in the first 18 months will relate to general tasks and the following five objectives.

**Task 8.1 TenC Competence Observatory**

WP8 Task 8.1 addresses the following Key Objectives of the TENCompetence project:

For an organization in Europe it is still hard to assess the competencies of applicants, employees and learners who have studied and worked in a variety of settings. To this end TENCompetence will provide models and software tools to assess the competencies of individuals, groups and organizations in an exchangeable way. An interoperable mechanism to express and exchange learners’ competencies will be developed, especially for informally acquired knowledge and competencies. Core aspects of such a mechanism are methods and technologies for interoperable person and group portfolio's and personal development plans, and interoperable competence definitions. Thus, the scope of WP8 Task 1 is to design and develop a Competence Observatory to monitor and capture the competences that have to be acquired in different professional and academic fields, in an interoperable way following the current state of art specifications namely IMS RDCEO and HR-XML. To this end, in this Milestone (M8.1), we present a review of current state-of-the-art specifications for describing competencies, (namely, IMS RDCEO and HR-XML) and propose a joint information model to be used in TenC Competence Observatory for supporting both specifications (see chapter 2.1 of this document). Moreover, towards identifying the main functional requirements of the TenC Competence Observatory, a review of the functionalities provided by existing Web-Based Observatories has been made (see chapter 2.1 of this document).

Additionally, in this Milestone, we present the design of the TenC Competence Observatory, with detailed Scenarios of Use, Functional and Non-Functional Requirements and Use Cases of the System (see chapter 2.2 of this document).
Task 8.2 Overview Tool

Within task 8.2 we are focussing on designing an interactive system to provide with an overview of possible formal and informal programmes and other learning opportunities that are available for users to develop their competencies. This includes search facilities, support through collaborative filtering and social interaction, data mining and visualization of search results. Users after accessing our platform will gradually develop a good understanding and ultimately select the most appropriate Competence Development Opportunities. In order to achieve that we must take explicitly into consideration the social context and dynamics in which such processes take place. Therefore, such an interactive system can be best conceptualized and designed as a Virtual Community Environment with a number of Specific Features and Embedded Dynamics, all oriented towards helping users to:

- gain an overview of and become aware of relevant Competence Development Opportunities (CDO),
- build an informed opinion about which ones would best fit their objectives and aspirations, and
- get the possibility to share their experiences and engage in productive knowledge exchanges with other users.

Task 8.3 Social Agents

The task will identify services and policies that foster social exchange in networks for lifelong competence development. It will also develop and test policies and software agents to stimulate the pro-active sharing of learning and knowledge resources among users. It will identify reward mechanisms, member participation, terms of use, quality standards and procedures, including their ontological requirements. It will describe and prepare experimental test beds to test the effects of policies and social exchange services on sharing behaviour amongst members and the management of the network.
Task 8.4 Network Management

This task will identify services that foster successful, self-organizing communities. It will describe and prepare experimental test beds to test the effects of the models and tools on the self-organisation of the network.

Successful communities are characterized by boundaries, which protect the collective good of the communities and provide guidelines to foster ongoing interactions among its members. According to Kollock & Smith (1996) and Koper et al (2004), communities are characterized by boundaries, rules, monitoring possibilities and sanctioning mechanisms. Although norms and rules arise out of member interaction, policies and purpose of the community need to be communicated in order to set initial boundaries within which to act. These policies can then be renegotiated by community members as the network evolves.

The purpose and goals of the community have to be explicit to instil a sense of identity and value for members in the community. Such goals should be transparent and as simple as possible. Additionally, specialization of roles has been associated with effective self-organizing systems. Roles help position and clarify the relationship between members. Roles also delineate the responsibility of each member for the production or maintenance of collective goods, and to stimulate the transition of lurkers and passive members to more active poster and co-developers of knowledge.

Additionally, reward and incentive mechanisms need to be in place to encourage users to share, use and contribute knowledge. Thibaut & Kelly’s (1959) theory on rewards, derived from the rational choice theory, which suggests that individuals conduct a cost-benefit analysis to evaluate various courses of action before selecting one which provides the best value at lowest cost from any transaction completed. Four main incentive mechanisms are reported in literature that are relevant in motivating and encouraging people to participate in communities: personal access, personal reputation, social altruism and tangible rewards (see also Hummel et al, (2005)). These mechanisms should be implemented and adapted to meet the objectives and motivation of learners.
Task 8.5 Roadmap

*Develop a roadmap for further work* to inform the planning process for the subsequent 18-month periods.
2.1 Review of Competence Models and Web-based Observatories

Introduction

In a rapidly changing world where information and education takes the first place in order to advance the social, cultural and living standard of all citizens, Lifelong Learning is the key point. However, Lifelong Learning is still defined in a variety of ways in different national contexts and for different purposes. The Commission of the European Communities and the Member States [16] have defined lifelong learning, within the European Employment Strategy, as all purposeful learning activity, undertaken on an ongoing basis with the aim of improving knowledge, skills and competence.

Lifelong Learning concerns everyone’s future, in a uniquely individual way and must be seen as an umbrella under which all kinds of teaching and learning should be united. Lifelong Learning is no longer just one aspect of education and training; it must become the guiding principle for provision and participation across the full continuum of learning contexts [16].

The concept of lifelong learning refers to the activities people perform throughout their life to improve their knowledge, skills and competence in a particular field, given some personal, societal or employment related motives [17, 18, 19].

In this context competence-based learning provides the facilities in order for individuals to upgrade their knowledge, skills and competence in a discipline throughout their lives as required for a lifelong competence development. Competence based learning meets the needs of learners at various levels of competence varying from novices to top-experts, from practitioners to researchers and developers.

Competence-based approaches in the field of formal or non-formal education are becoming more common and appear to offer the opportunity to develop flexible programmes that meet needs of learners, trainers and potential employers. In order to support and use effectively this link between competence and education, there is need to provide reusable definitions of competencies, across the different systems.
Description models for competencies are coming to provide a solution to this interoperability-problem which can be achieved by the conformance to the existing data models for competences description, such as IEEE RCD (Reusable Competency Definition) [21], IMS-RDCEO (Reusable Definition of Competency or Educational Objective) [20] and HR-XML [23].

According to the TenCompetence Domain Model [40] the TenCompetence Project adopts a common competence interoperability framework for the description of competencies. This framework should build on the current specifications from HR-XML format and IMS RDCEO.

One of the main objectives of this document is the definition of a CDM (Competence Description Model) conformant to the current state-of-the-art specifications, namely, IMS RDCEO and HR-XML, through a XML-based model that maps the above mentioned specifications.

According to the Description of Work of the TenCompetence Project [1], our goal is to develop and set up a competence observatory, in order to monitor and capture the competencies that have to be acquired in different professional and academic fields. The TenC Competence Observatory will be used by the TenCompetence project, in order to bring experts together to discuss and decide upon the competencies per job/function.

The Competency Description Model (CDM) is going to be used for the description of the competencies that will be held in the database of the TenC Competence Observatory.

The other main objective of this document is to identify the main functionalities of a web-based observatory by reviewing existing observatories. These functionalities will be our guide for the design of the TenC Competence Observatory.

This document is structured in two parts. In the first part of the document, we present a few definitions about competencies in order to understand which the dimensions of a competency are and we also present the definition about competency description models. Then we present the existing competency description models starting from the IMS RDCEO Specification and we demonstrate its use in a real case study, namely, the Europass Language Passport. In the next section we present the HR-XML Specification about competencies and we also demonstrate its
use via the Europass Language Passport. Afterwards we come forward in a mapping of IMS RDCEO Specification and HR-XML Specification and at the end we provide our CDM that will be used as the description model for the competencies that will be record in our observatory.

In the second part of the document we present the definitions of observatories and web-based observatories. Afterwards we provide examples of existing web-based observatories in the area of e-learning and we review the functionalities that each of these systems provide. Finally we provide a comparison of these existing observatories and we identify the basic functionalities that will be used for the design of TenC Competence Observatory.
Part A: Competency Models

Definition of Competency Models

The word competency is derived from Latin word "Competere" which means 'to be suitable'. The competency concept was originally developed in Psychology denoting individuals' ability to respond to demand placed on them by their environment. (http://www.indiainfoline.com/bisc/imtfac08.html)

The word "competency" itself is a subject to multiple interpretations. A fundamental difference in interpretation hinges on whether a competency is seen as a personal construct (a trait) or observable aspects of performance (required behaviors and activities). Another fundamental difference in interpretation has to do with whether a competency is viewed as a requirement for successful performance or a requirement for achieving excellence.

Most commonly a competency is defined as a category or grouping of related behaviors/activities, types of knowledge, technical skills, or motivations. They represent the behavioral, technical, and motivational requirements for successful performance in a given role or job.

Below we provide a short sample of definitions about competencies:

- "An observable, measurable pattern of skills, knowledge, abilities, behaviors & other characteristics that an individual needs to perform work roles or occupational functions successfully"[24]

- "A competency is an underlying characteristic of an individual that is directly related to effective or superior performance in a job. Differentiating competencies distinguish superior from average performers" [25]

- "A set of skills, related knowledge and attributes that allow an individual to perform a task or an activity within a specific function or job” [26]
- “Competency is a term that describes the range of knowledge, skills, behaviour, attitude and abilities an individual brings to a specific area of a job, such as team working” [27]

- “An underlying characteristic of an employee (i.e., a motive, trait, skill, aspects of one’s selfimage, social role, or a body of knowledge) which results in effective and/or superior performance” [28]

- “Competency is defined as any knowledge, skill, trait, motive, attitude, value or other personal characteristic that is essential to perform the job and that differentiates good from superior performance” [29]

- “A knowledge, skill or attitude that enables one to effectively perform the activities of a given occupation or function to the standards expected in employment” [30]

- “Ability to apply appropriate skills and knowledge for the effective and efficient completion of a job or task in a variety of situations” [31]

- “Is a major skill a student will learn and demonstrate in a course. A competency must be measurable and observable” [32]

- “Specialist knowledge or skills required to perform a job function” [33]

- “Competency is a broad concept that describes a person’s ability in a range of areas. It covers: task skills (performing individual tasks), task management skills (managing a number of different tasks within the job), contingency management skills (responding to problems, breakdowns and changes in routine) job or role environment skills (dealing with the responsibilities and expectations of the workplace)” [34]

- “Competence is a standardized requirement for an individual to properly perform a specific job. It encompasses a combination of knowledge, skills and behavior utilised to improve performance. More generally, competence is the state or quality of being adequately or well qualified, having the ability to perform a specific role” [4]
“A specific, identifiable, definable, and measurable knowledge, skill, ability and/or other deployment-related characteristic (e.g. attitude, behavior, physical ability) which a human resource may possess and which is necessary for, or material to, the performance of an activity within a specific business context” [23]

Competency description models define an information model for describing, referencing, and exchanging definitions of competencies. There are two existing specifications for describing competencies. The first one derives from the domain of e-learning and it is called IMS RDCEO specification [20] and the other specification derives from the human resource domain and it is called HR-XML specification [23].

The IMS RDCEO specification [20] provides a means to create common understandings of competencies that appear as part of a learning or career plan, as learning pre-requisites, or as learning outcomes. The information model in this specification can be used to exchange these definitions between learning systems, human resource systems, learning content, competency or skills repositories, and other relevant systems.

The HR-XML specification has been developed from the HR-XML Consortium [22]. The HR-XML Consortium is an independent, non-profit organization dedicated to the development and promotion of a standard suite of XML specifications to enable e-business and the automation of human resources-related data exchanges.

The scope of HR-XML Consortium [23] when a Schema for Competencies was building, was not only a definition of a model for describing competencies but also recording evidences used to substantiate a competency and ratings and weights that can be used to rank, compare, and otherwise evaluate the sufficiency or desirability of a competency.
IMS RDCEO Specification Review

Introduction to IMS RDCEO and IEEE RCD Specifications

In order to support and use effectively the link between competence and education, there is need to provide reusable definitions of competences, across the different systems. Description models for competences, such as the IEEE Reusable Competency Definition (IEEE RCD) [21] and the IMS Reusable Definition of Competency or Educational Objective (IMS RDCEO) [20] specification, are coming to provide a solution to this problem.

The IMS RDCEO specification defines an information model for describing, referencing, and exchanging definitions of competencies, primarily in the context of online and distributed learning. This specification, aims to provide the means for formally representing the key characteristics of a competency, independently from its use in a particular context. It, thus, aims to guarantee interoperability among e-training systems that deal with competency information, by allowing them to refer to common definitions with commonly recognized values.

On the other hand, the IEEE RCD specification describes a Competency Definition as used in a Learning Management System or referenced in a Competency Profile, by making direct reference of the IMS RDCEO specification.

IMS RDCEO Information Model

The IMS RDCEO information model is purposely minimalist and extensible in order to provide the flexibility to different organisations from different sections to describe their own Competence Model. The metadata elements in the Metadata category of IMS RDCEO provide the means for achieving the extensibility of the corresponding specification.
The IMS RDCEO information model contains the following core elements:

1. **Identifier**: A globally unique label that identifies this definition of competency or educational objective. The “Identifier” element consists of two other sub-elements: “Catalog” and “Entry”.

2. **Title**: A short name for this competency or educational objective. The “Title” may be repeated in multiple languages.

3. **Description**: A narrative description of the competency or educational objective. The “Description” may be repeated in multiple languages.

4. **Definition**: A structured description that provides a more complete definition of the competency or educational objective, using a collection of statements that determine a competency or an educational objective. Typically, such models define a competency or educational objective in terms of a “statement, conditions, criteria”, “proficiency, criteria, indicators”, “standards, performance indicators, outcomes”, “abilities, basic skills, content, process”, and similar sets of statements. The “Definition” consists of two other sub-elements: “Model Source” and “Statement”.

5. **Metadata**: Optional meta-data record that further describe the RDCEO. The meta-data records must be conform to IEEE 1484-12.1-2002 (IEEE Learning Object Metadata) [35].
Case Study – The Europass Language Passport

The European Commission [36] has recently adopted a decision (No 2241/2004/EC) of the European Parliament and of the Council of Europe on a single framework for the transparency of qualifications and competencies. Europass is an open system that supports European policy developments related to the transparency of competences and qualifications. Europass [37] will help citizens to convey their qualifications and competences in an effective way, by providing a comprehensive tool for users based on an accessible electronic format. Additionally, Europass will promote strong links between education and training, business and industry, ensuring the continuing relevance and adequate appreciation of competences and qualifications.

Europass consists of five documents [37]:

1. **Europass CV**: The Europass CV enables you to make your skills and qualifications visible around the Europe. The Europass-CV includes categories for the presentation of information on personal matters, emphasising technical, organisational, artistic and social skills, language proficiency, work experience and educational and training attainments.

2. **Europass Language Passport**: The Europass Language Passport allows you to describe your language skills, skills that are vital for learning and working in Europe. The Europass Language Passport was developed by the Council of Europe as part of the European Language Portfolio which consists of three documents: the Language Passport, the Language Biography and the Dossier.

3. **Europass Mobility**: The Europass Mobility is a record of any organised period of time (called Europass Mobility experience) that a person spends in another European country for the purpose of learning or training. The mobility experience is monitored by two partner organisations, the first in the country of origin and the second in the host country. Both partners agree on the purpose, content and duration of the experience; a mentor is identified in the host country. The partners may be universities, schools, training centres, companies, etc.

4. **Europass Diploma Supplement**: The Europass Diploma Supplement is issued to graduates of higher education institutions along with their degree or diploma. It helps to
ensure that higher education qualifications are more easily understood, especially outside the country where they were awarded. The Europass Diploma Supplement was developed jointly with Unesco and the Council of Europe.

5. **Europass Certificate Supplement**: The Europass Certificate Supplement is delivered to people who hold a vocational education and training certificate; it adds information to that which is already included in the official certificate, making it more easily understood, especially by employers or institutions outside the issuing country. The information in the Europass Certificate Supplement is provided by the relevant certifying authorities.

In this section, we use the Europass Language Passport as an example for implementing the data structures of IMS RDCEO Specification (the IMS RDCEO representation of Europass Language Passport can be found at Appendix D)

The Europass Language Passport [38], a European common Model for language competencies was developed by the Council of Europe as part of the European Language Portfolio. It supports the definition of individual’s language skills on a six-level scale and it was designed to enhance the motivation of individuals to improve their ability to communicate in different languages. It has two functions: motivating learners to study languages and helping them think about their learning goals, and providing a clear way of recording language skills.

The EuroPass Language Passport defines a competence ontology consisting of 5 simple competencies and 3 complex competencies. Each of these competencies is associated (directly or indirectly) with a list of language topics (see Fig. 2).
Conclusions

In this chapter we investigate the IMS RDCEO Specification. The IMS RDCEO specification is only a description tool for competencies and does not show how individual reusable competency definitions can be aggregated to form broader competencies or how competencies are to be assessed, certified, recorded etc. So, based on the description capacity of the IMS RDCEO specification, we have identified the following open issues:

- **How to represent the level of a competency?** The IMS-RDCEO specification supports the representation of a competency level, within the “title” element. The information stored within this element is in a narrative format, thus, it is not machine understandable and limits the scope of interoperability among different systems.

- **How to represent the grading scale of a competency?** The IMS-RDCEO specification does not provide a way to represent the “grading scale” of a competency, thus, provides limited support for the assessment of complex competencies.
How to represent the success threshold of a competency? The IMS-RDCEO specification does not support the definition of a “success threshold” for a competency. Therefore, a learning system cannot interpret the existence of a competence.

How to describe complex competencies in an interoperable way? The IMS-RDCEO already supports the definition of complex competencies (that is, any competency consisting of other – simple or complex – competencies) through the use of “metadata/relation” element. However, it does not provide a way to represent the weighting factor of sub-competencies when assessing a complex one, thus, provides limited support for the assessment of complex competencies.

HR-XML Specification Review

Introduction to HR-XML Specification

The HR-XML Consortium [22] is an independent, non-profit organization dedicated to the development and promotion of a standard suite of XML specifications to enable e-business and the automation of human resources-related data exchanges.

In order to achieve this scope, HR-XML Consortium has produced a library of more than 100 interdependent "XML schemas". XML Schemas define the data elements for particular HR transactions, as well as options and constraints governing the use of those elements. The HR-XML Consortium has produced schemas covering major processes, as well as component schemas, used across multiple business processes.

The Competencies schema allows the capture of information about evidence used to substantiate a competency and ratings and weights that can be used to rank, compare, and otherwise evaluate the sufficiency or desirability of a competency [23].

One of the challenges in creating a standard schema for the exchange of competency information is the many ways that the term “competency” has been used by different people at different points in time within disciplines such as human resource management, organizational theory, behavioral science, industrial psychology, and education.
Therefore, one of the HR-XML Competency Workgroup’s important design goals was “the development of a competency schema that would be relatively simple and sufficiently flexible to be useful within a variety of business contexts”.

**HR-XML Information Model**

The HR-XML data model is purposely simple in order to provide the flexibility to different organisations to describe their own Competence Model within a variety of business contexts. Additionally this standard schema for the exchange of competency data will improve the communication across many HR systems and will simplify data transfer processes, thereby helping HR organizations save time and money.

The HR-XML information model contains the following core elements:

1. **Name**: A short name for the related competency.

2. **Description**: A narrative description of the competency.

3. **Required**: A boolean used to indicate whether the CompetencyEvidence is mandatory for a particular position or given context.

4. **CompetencyId**: An identification code assigned to identify or classify the competency.

5. **TaxonomyId**: A code that identifies the taxonomy of the competency.

6. **CompetencyEvidence**: A text label that is used to capture information to substantiate the existence, sufficiency, or level of a Competency. CompetencyEvidence might include test results, reports, performance appraisals, evaluations, certificates, licenses, or a record of direct observation, such as a report given by a former supervisor or other employment reference.

7. **CompetencyWeight**: A text label that allows the capture of information on the relative importance of the Competency.
8. **Competency:** Competencies can be recursive. A competency may include other competencies. One competency might be decomposed into several component competencies, each of which might be separately measurable.

9. **User Area:** Personal information about the individual that holds the defined competency.

![The HR-XML Information Model](image)

**Figure 3:** The HR-XML Information Model

**Case Study – The Europass Language Passport**

In this section, we use again the Europass Language Passport as we did in section 3.3, in order to implement the data structures of HR-XML specification about competencies. The examples that we use are the same as in IMS RDCEO, in order to illustrate the difference between the data structures of these two corresponding specifications. (The HR-XML representation of Europass Language Passport can be found at Appendix E)
Conclusions

In this chapter we investigate the HR-XML Specification. The HR_XML specification contrary to IMS RDCEO is not only a description model for competencies but allows the capture of information about evidence used to substantiate a competency and ratings and weights that can be used to rank, compare, and otherwise evaluate the sufficiency or desirability of a competency. Based on the description capacity of the HR-XML specification, some of the open issues that we have set in section 3.4 can be refined as above:

- **How to represent the level of a competency?** The HR-XML specification supports the representation of the proficiency level of a competency, within the “CompetencyWeight” element. This element also permits the capture of the minimum and the maximum value for the proficiency level of the relative competency.

- **How to represent the grading scale of a competency?** The HR-XML specification does not provide a way to represent the “grading scale” of a competency, thus, provides limited support for the assessment of complex competencies.

- **How to represent the success threshold of a competency?** The HR-XML specification does not support the definition of a “success threshold” for a competency. Therefore, a learning system cannot interpret the existence of a competence.

- **How to describe complex competencies in an interoperable way?** The HR-XML supports the definition of complex competencies through the use of “Competency” element. However, it does not provide a way to represent the weighting factor of sub-competencies when assessing a complex one, thus, provides limited support for the assessment of complex competencies.
Mapping of IMS-RDCEO and HR-XML

Introduction

The scope of IMS RDCEO specification is the definition of an information model for describing competencies in the context of e-learning. The IMS RDCEO specification does not show how individual reusable competency definitions can be aggregated to form broader competencies and does not address how competencies are to be assessed, certified, recorded etc.

In comparison, the scope of HR-XML Consortium when a Schema for Competencies was building, was not only a definition of a model for describing competencies but also recording evidences used to substantiate a competency and ratings and weights that can be used to rank, compare, and otherwise evaluate the sufficiency or desirability of a competency.

Therefore we are talking about two models, from different domains, the e-learning domain and the business domain, that describes the same object – competencies – but each of these models using different elements and capturing different type of information about competencies. In the section below, we are going to illustrate the mapping between the elements of these two description models for competencies, in order to present what the same elements are and what is the information’s overlapping in these two models.

Mapping of IMS RDCEO and HR-XML Elements

In the figure below we represent the mapping between the elements of IMS RDCEO and HR-XML specifications. As we can see both specifications have dispose elements for capturing information like as:

- the identification of the competency (Identification - CompetencyId),
- the title of the competency (Title - Name),
- the description of the competency (Description - Description),
- the definition of the competency (Definition - Competency).

However, HR-XML specification has elements like CompetencyEvidence and CompetencyWeight that does not match with none of IMS RDCEO elements, cause IMS RDCEO
specification address only the description part of a competency and not with the part of recording evidences about a specific competency.

Additionally, HR-XML specification has elements like TaxonomyId that does not match with none of IMS RDCEO elements cause IMS RDCEO intentions is “to meet the simple need of referencing and cataloguing a competency, not classifying it” and UserArea that also does not match with none of IMS RDCEO elements but is matching with elements form another specification of IMS, the IMS LIP (Learner Information Profile) that is a model for describing the learner’s profile including a variety of information.

Nonetheless, IMS RDCEO permits the embedding of optional meta-data as specified in the information model. So, an implementation might include taxonomy information through the use of meta-data as we can see in Figure 13.
Figure 4: Mapping of IMS RDCEO and HR-XML Specifications
The proposed CDM for TenC Competence Observatory based on IMS RDCEO and HR-XML Mapping

CDM Information Model

The CDM information model contains the following core elements:

1. **Identifier**: A globally unique label that identifies this definition of competency or educational objective. The “Identifier” element consists of two other sub-elements: “Catalog” and “Entry”.

2. **Title**: A short name for this competency. The “Title” may be repeated in multiple languages.

3. **Description**: A narrative description of the competency or educational objective. The “Description” may be repeated in multiple languages.

4. **ProficiencyLevel**: The proficiency level of the competency. There may be multiple instances of this category.
5. **Classification:** This category describes where this competency falls within a particular classification system. To define multiple classifications, there may be multiple instances of this category.

6. **Relation:** Competencies can be recursive. A competency may refer to other competencies.

![CDM Information Model Diagram](image)

**Figure 6:** The CDM Information Model

The elements of CDM are depicted in Table 15. In this table each element is described using the following properties:
No: The number of the data element. An element may be composed of sub-elements. The numbering scheme reflects these relationships.

Name: The descriptive name of the element.


Required: Indicates if the element is required:
- **M** = Mandatory Element that must be included in the data object, if the element at the higher level is included;
- **C** = Conditional Element. Existence is dependent on values of other Elements;
- **O** = Optional Element.

Multi: Multiplicity of the element:
- **Single** = single instance;
- **Single * = single instance per language**;
- **Number** = maximum number of times the element is repeatable;
- **n** = multiple occurrences allowed, no limit;

Repeatability of an element implies that all sub-elements repeat with the same element.

Datatype: A description of formatting rules for the data element. Type includes the maximum length of the element.

Notes: Additional descriptive information about the element.

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Explanation</th>
<th>Req</th>
<th>Multi</th>
<th>Datatype</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Identifier</td>
<td>A globally unique label that identifies this definition of competency</td>
<td>M</td>
<td>Single</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Catalog</td>
<td>The name or designator of the identification</td>
<td>M</td>
<td>Single</td>
<td>CharacterString (smallest permitted maximum:</td>
<td>Example: &quot;ISBN&quot;, &quot;ARIADE&quot;, &quot;URI&quot;, &quot;<a href="http://acme.org/co">http://acme.org/co</a>&quot;</td>
</tr>
</tbody>
</table>

TENCompetence – IST-2005-027087
<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Explanation</th>
<th>Req</th>
<th>Mult</th>
<th>Datatype</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Entry</td>
<td>The value of the identifier within the identification or cataloguing scheme that designates or identifies this definition of competency. A namespace specific string</td>
<td>1000 characters</td>
<td>mpmmodcat&quot;</td>
<td>Example: &quot;2-7342-0318&quot;, &quot;LEAO875&quot;, &quot;<a href="http://imsglobal.org/dco/1234">http://imsglobal.org/dco/1234</a>&quot;</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Title</td>
<td>Name given to this competency</td>
<td>2000 characters</td>
<td>Example: &quot;English proficiency&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Description</td>
<td>A textual description of the competency</td>
<td>2000 characters</td>
<td>Example: &quot;Proficiency in written and spoken English and use of English for meaningful oral or written expression.&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>ProficiencyLevel</td>
<td>The proficiency level of the competency</td>
<td>O</td>
<td>Single</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1</td>
<td>Level</td>
<td>There may be multiple instances of this category</td>
<td>M</td>
<td>n</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.1</td>
<td>Title</td>
<td>The title of the proficiency</td>
<td>M</td>
<td>Single*</td>
<td>Example: &quot;A2 Listening Level&quot;</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Name</td>
<td>Explanation</td>
<td>Req</td>
<td>Mult</td>
<td>Datatype</td>
<td>Notes</td>
</tr>
<tr>
<td>----</td>
<td>----------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----</td>
<td>------</td>
<td>-------------------</td>
<td>------------------------------------------------------</td>
</tr>
<tr>
<td>4.1.2</td>
<td>Type</td>
<td>The type of the proficiency level</td>
<td>M</td>
<td>Single</td>
<td>Enumerated</td>
<td>Example: &quot;Knowledge Level&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>as &quot;Knowledge Level&quot;, “Skill Level”, “Attitude Level&quot;</td>
<td></td>
</tr>
<tr>
<td>4.1.3</td>
<td>Description</td>
<td>A textual description for the proficiency level</td>
<td>O</td>
<td>Single*</td>
<td>LangString</td>
<td>Example: &quot;Can understand familiar words and very basic phrases&quot;</td>
</tr>
<tr>
<td>4.1.4</td>
<td>Value</td>
<td>Rating values for this competency. There may be multiple instances of this category</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.4.1</td>
<td>NumericValue</td>
<td>NumericValue is the required or measured level for the competency. The content of NumericValue is a rating value.</td>
<td>O</td>
<td>Single</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.4.1.1</td>
<td>MinValue</td>
<td>The minimum value of the rating scale.</td>
<td>M</td>
<td>Single</td>
<td>Double (in the range 1 to 100)</td>
<td>Example: &quot;1&quot;</td>
</tr>
<tr>
<td>4.1.4.1.2</td>
<td>MaxValue</td>
<td>The maximum value of the rating scale.</td>
<td>M</td>
<td>Single</td>
<td>Double (in the range 1 to 100)</td>
<td>Example: &quot;10&quot;</td>
</tr>
<tr>
<td>No</td>
<td>Name</td>
<td>Explanation</td>
<td>Req</td>
<td>Mult</td>
<td>Datatype</td>
<td>Notes</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----</td>
<td>------</td>
<td>----------------------------------------------------------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>4.1.4.1.3</td>
<td>Interval</td>
<td>The increment or step for the relevant scale.</td>
<td>M</td>
<td>Single</td>
<td>Double (in the range 1 to 100)</td>
<td>Example: &quot;1&quot;</td>
</tr>
<tr>
<td>4.1.4.1.4</td>
<td>SuccessThresh old</td>
<td>The minimum value of the rating scale that proves the existence of the competency</td>
<td>M</td>
<td>Single</td>
<td>Double (in the range 1 to 100)</td>
<td>Example: &quot;5&quot;</td>
</tr>
<tr>
<td>4.1.4.1.5</td>
<td>Description</td>
<td>A textual description for the NumericValue field</td>
<td>O</td>
<td>Single*</td>
<td>LangString (smallest permitted maximum: 2000 characters)</td>
<td>Example: &quot;A rating scale for the English proficiency&quot;</td>
</tr>
<tr>
<td>4.1.4.2</td>
<td>StringValue</td>
<td>StringValue is the required or measured level for the competency. The content of StringValue is a rating value.</td>
<td>O</td>
<td>Single</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.4.2.1</td>
<td>MinValue</td>
<td>The minimum value of the rating scale.</td>
<td>M</td>
<td>Single</td>
<td>CharacterString (smallest permitted maximum: 2000 characters)</td>
<td>Example: &quot;A1&quot;</td>
</tr>
<tr>
<td>4.1.4.2.2</td>
<td>MaxValue</td>
<td>The maximum value of the rating scale.</td>
<td>M</td>
<td>Single</td>
<td>CharacterString (smallest permitted maximum: 2000 characters)</td>
<td>Example: &quot;C2&quot;</td>
</tr>
<tr>
<td>4.1.4.2.3</td>
<td>SuccessThresh</td>
<td>The</td>
<td>M</td>
<td>Single</td>
<td>CharacterString</td>
<td>Example: &quot;3&quot;</td>
</tr>
<tr>
<td>No</td>
<td>Name</td>
<td>Explanation</td>
<td>Req</td>
<td>Mult</td>
<td>Datatype</td>
<td>Notes</td>
</tr>
<tr>
<td>----</td>
<td>----------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----</td>
<td>------</td>
<td>-------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>old</td>
<td>minimum value of the rating scale that proves the existence of the competency</td>
<td></td>
<td></td>
<td>ng (smallest permitted maximum: 2000 characters)</td>
<td></td>
</tr>
<tr>
<td>4.1.4.2.4</td>
<td>Description</td>
<td>A textual description for the StringValue field</td>
<td>O</td>
<td>Single*</td>
<td>LangString (smallest permitted maximum: 2000 characters)</td>
<td>Example: &quot;Europass Levels&quot;</td>
</tr>
<tr>
<td>4.1.4.2.5</td>
<td>States</td>
<td>There may be multiple instances of this category</td>
<td>M</td>
<td>Single</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1.4.2.5 .1</td>
<td>State</td>
<td>An ordered list consists of the proficiency levels</td>
<td>M</td>
<td>n</td>
<td>CharacterString (smallest permitted maximum: 2000 characters)</td>
<td>Example: &quot;A1&quot;,&quot;A2&quot;,&quot;B1&quot;,&quot;B2&quot;,&quot;C1&quot;,&quot;C2&quot;</td>
</tr>
<tr>
<td>5</td>
<td>Classification</td>
<td>This category describes where this competency falls within a particular classification system. To define multiple classification s, there may be multiple instances of this category.</td>
<td>O</td>
<td>Single</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1</td>
<td>Taxonomy</td>
<td>A taxonomic path in a specific classification system. Each succeeding</td>
<td>M</td>
<td>n</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Level is a refinement in the definition of the preceding level. There may be different paths, in the same or different classification, which describe the same characteristic.

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Explanation</th>
<th>Req</th>
<th>Mult</th>
<th>Datatype</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1.1</td>
<td>Id</td>
<td>The identifier of the taxonomy</td>
<td>M</td>
<td>Single</td>
<td>CharacterString (smallest permitted maximum: 2000 characters)</td>
<td>Example: &quot;233&quot;</td>
</tr>
<tr>
<td>5.1.2</td>
<td>OwnerID</td>
<td>The name of the owner of this taxonomy</td>
<td>M</td>
<td>Single</td>
<td>CharacterString (smallest permitted maximum: 2000 characters)</td>
<td>Example: &quot;Acme Company&quot;</td>
</tr>
<tr>
<td>5.1.3</td>
<td>Description</td>
<td>A short description about the taxonomy</td>
<td>O</td>
<td>Single*</td>
<td>LangString (smallest permitted maximum: 2000 characters)</td>
<td>Example: &quot;Competency id is based on Acme internal taxonomy&quot;</td>
</tr>
<tr>
<td>6</td>
<td>Relation</td>
<td>The relation of this definition of competency with other sub-competencies</td>
<td>O</td>
<td>Single</td>
<td>LangString (smallest permitted maximum: 2000 characters)</td>
<td></td>
</tr>
<tr>
<td>6.1</td>
<td>Subcompetency</td>
<td>There may be multiple instances of</td>
<td>M</td>
<td>n</td>
<td>LangString (smallest permitted maximum: 2000 characters)</td>
<td></td>
</tr>
</tbody>
</table>
Table 1: The CDM Elements

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Explanation</th>
<th>Req</th>
<th>Mult</th>
<th>Datatype</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1.1</td>
<td>Identifier</td>
<td>An identifier that links to the Sub-Competency</td>
<td>M</td>
<td>Single</td>
<td>CharacterString</td>
<td>Example: &quot;<a href="http://www.languagecompetency.com">http://www.languagecompetency.com</a>&quot;</td>
</tr>
</tbody>
</table>

Conclusions

As we saw in this section, HR-XML specification is a composition of elements from IMS RDCEO specification (description data for the competency), from IEEE LOM standard (classification data for the competency) and from IMS LIP specification (personal data for the individual that holds a specific competency).

Additionally, HR-XML has elements like CompetencyEvidence that is used to capture information to substantiate the existence, sufficiency, or level of a competency and CompetencyWeight that is used to record information about the importance of the competency.

When we want to create reusable definitions of competencies the elements that we want to use or better, the information that we don’t want to record is the following:

- Personal information about the individual that is holding a specific competency.
- Evidences that substantiate the existence of a competency.

So, may be the description capacity of the IMS RDCEO specification is elliptic and does not provide the means for the full description of a competency, but in the other side HR-XML is a bit steep because captures information that reduces drastically the reusability.

Therefore, we decide to create a model that takes elements from IMS RDCEO specification and elements from HR-XML, in order to create reusable definitions of competencies. Substantially, because HR-XML overbalances IMS RDCEO our CDM is a short version of HR-XML enhanced with new elements.
Part B: Web-Based Observatories

Definition of Web-Based Observatories

Below we provide a variety of definitions about observatories:

- “An observatory is a location used for observing terrestrial and/or celestial events. Astronomy, astrology, climatology, geology, meteorology, oceanography and volcanology are examples of disciplines for which observatories have been constructed. Historically, observatories were as simple as containing a sextant (for measuring the distance between stars) or Stonehenge (which has some alignments on astronomical phenomena)” [4]

- “A building, place, or institution designed and equipped for making observations of astronomical, meteorological, or other natural phenomena” [3]

- “A structure overlooking an extensive view” [3]

- “A place or building for making observations on the heavenly bodies” [5]

- “A building fitted with instruments for making systematic observations of any particular class or series of natural phenomena” [5]

- “A place, as an elevated chamber, from which a view may be observed or commanded” [5]

- “A lookout on a flank of a battery whence an officer can note the range and effect of the fire; usually referred to as an observation post” [5]

Concluding the above definitions we could define an observatory as a structure, a building or a place designed and equipped for making observations about a specific domain.
From the research we have done in order to gather the available definitions about web-based observatories we did not find any results. Therefore and taking into account the definition of an observatory we can say that a web based observatory is a “virtual place” that gathers observations about a specific domain in a database and monitors these results by the use of web. As we can see in the figure below the basic functionalities provided by a web-based observatory are two-stage actions, the first performed by the user and the second by the observatory: search/expose, submit/store, request/deliver.

![Diagram of Web-Based Observatory Main Functionalities](image)

**Figure 7:** Web-Based Observatory Main Functionalities
Existing Web-Based Observatories

The CEN/ISSS Learning Technology Standards Observatory

The Learning Technology Standards Observatory [6] is a web based observatory that acts as a focal access point to projects, results, activities and organisations that are relevant to the development and adoption of e-learning technology standards. The system allows the visitors without registering, to search all over the observatory and find the desirable information between the relevant standards and specifications they want, as well as between the organisations that develop, define, profile or implement them. The contents included in the Learning Technology Standards Observatory are mostly taken from the web sites of other institutions and bodies.

Information available at the Learning Technology Standards Observatory (LTSO) includes:

− Summary of each standard or proposal including key data in order to allow the user to grasp the gist of the specification.
− Tracking data on the evolution of the standard through the different drafts.
− Relationship and main difference among proposed specifications and standards for the same category.
− Clarification of the relationships between formal standardization bodies (ISO, CEN, IEEE),
− Specification development consortia (such as ARIADNE and IMS) and profiling bodies (such as CANCORE, ALIC, and others).
− Links to the complete set of specifications (if available on-line) or to information on where to obtain them.
− Information on the actual uptake of specifications and standards.
− Information about relevant events, activities and organizations.
Figure 8: The CEN/ISSS Learning Technology Standards Observatory

The IDABC Open Source Software Observatory

The IDABC (Interoperable Delivery of European eGovernment Services to public Administrations, Businesses and Citizens) Observatory [7] is dedicated to Free/Libre/Open Source Software and is intended to encourage the spread and use of Best Practices in Europe. It provides an introduction for new users to the concept of Free/Libre/Open Source Software and presents interesting events, activities, case studies and references for experts.
The Basic Skills Agency Observatory

The Observatory of Basic Skills [8] is a source of information about literacy, numeracy and language in England and Wales. The priorities of this observatory are:

- speaking and listening skills,
- transition points such as starting school, or a new job,
- engaging the disengaged.

In order to improve the basic skills of young people and adults this observatory provides a list of useful sources for basic skills policy and research.
The European Quality Observatory [9] is an internet-based repository implemented as a portal to promote the use of quality management, quality assurance and quality assessment concepts for eLearning in different communities. The main objective is to provide a central facility enabling developers, managers, administrators, decision-makers and end-users to find an approach that suits their organisation's needs. In particular, national, regional, and local needs and requirements are included in the observatory, resulting in a European Quality Community.

The EQO users are able to contribute quality approaches & experiences to the database, use all search and adaptation services, get newest information about EQO work (newsletter), and participate and discuss in forums. (http://www.eqo.info/)
The Public Population Project in Genomics Observatory

The Public Population Project in Genomics (P3G) observatory [10] is an international consortium of public bodies involved in major genetic epidemiology projects and bio-banks. It was created to develop and manage a multidisciplinary infrastructure for comparing and combining results from large-scale population genomic studies, to facilitate the translation of research into clinical benefits in terms of disease prevention and treatment.

The P3G Observatory aims to disseminate scientific and technical information produced by member groups, and to provide suitable tools for the development, co-ordination and comparison of studies. To this latter end, the Observatory contains a catalogue of all major population genomics studies around the world (including those run by groups who are not P3G members) that can be used to access and compare information about different projects.
The “économie langues formation” Observatory

The “économie langues formation” Observatory [11] began its activities, with financial support from the Rector of the University of Geneva. Its chief mission is to offer contributions to research and teaching on the interrelations between the economy, languages and education. A particular emphasis is placed on the developing of tools for the management of linguistic diversity.

The élf users are able to get newest information about programmes and publications relating to the field of diversity management.
The Helios Observatory

HELIOS [12] is an observation platform, funded under the e-Learning program of the European Commission and it aims to monitor the progress of e-Learning in Europe vis-à-vis policy objectives and to forecast future scenarios of e-Learning evolution integrated research and development project. In the framework of the HELIOS project, six thematic analyses intended to observe the impact of e-Learning on a number of key priorities of the EU and national policy agenda (as defined after the Lisbon Council) are going to be carried out. The thematic priorities are:

- Access to learning,
- Employability,
- Personal development/citizenship,
- Internationalisation of Education and Training,
- Organisational change,
The LEONIE (Learning in Europe: Observatory on National and International Evolution) Observatory

The LEONIE observatory [13] is focused on trends and drivers of change affecting European Education and Training systems. Each partner of this project, produced a document summarizing national and international trends of education and training systems, and identified main drivers of change. The main objectives of LEONIE observatory is:

- To identify major drivers of change, in economy and society, which effect the present and future development of education and training,
- To identify and develop a capacity to monitor the innovation processes that are taking place within education and training systems, and that are intentionally implemented by the relevant authorities and players,
- To build and validate a series of indicators, that will allow comparisons in time and between countries, of change processes affecting education and training,
To establish a capacity to forecast the likely evolution of education and training in Europe,
To build different levels of multi-actor partnership to make the validated observation components sustainable in the medium and long term
and provide the outcome information through the observatory not only to users from the standard target groups like as policy makers, but to the general public.

Figure 15: The LEONIE (Learning in Europe: Observatory on National and International Evolution) Observatory

The POLE (Policy Observatory for Lifelong learning and Employability) Observatory

The POLE observatory [14] addresses the needs for better understanding the relationships between lifelong learning policies and practice and the use of Information and Communication Technologies (ICT). The project aims at elaborating answers about the ways that ICT can enhance and amplify the results of lifelong learning policies, especially in the framework of the eLearning Initiative and following the recommendations in the Memorandum of Lifelong Learning.
The main target group comprises the policy makers and policy implementers, who are dealing with lifelong learning in the above areas (Employability and Social Inclusion), while a second broader target group consists in the entire research community in lifelong learning, education and training in general, social inclusion, employability.

Figure 16: The POLE (Policy Observatory for Lifelong learning and Employability) Observatory

The **PASCAL** (Place Management, Social Capital and Learning Regions) Observatory

The PASCAL Observatory [15] is founded on the presumption that there is considerable work to be done to enable regional governments and associated policy-makers to benefit fully from emerging research and learning about how best to foster balanced and sustainable economic and social development in their regions. PASCAL offers a single, online portal which brings together relevant documents, analysis, news, events and research, providing easy, cost effective and efficient access to relevant and useful information.

The following services are currently available:

- substantial monthly reports on hot topics, prepared by international experts
- regular briefings on emerging issues, prepared by staff within the Observatory
TEN WP8 – Competence Observatory, Overview Tool, Agents, Games and Network Management

– an electronic library providing details of relevant policy, research and programmes associated with successful interventions of various kinds
– notes on current demonstration projects which demonstrate the potential and achieved benefits from public/private partnership initiatives
– a news clipping service of news stories from around the world
– notices of forthcoming conferences and seminars
– notices of new and forthcoming books
– a monthly newsletter by email which notifies users of recently published papers, reports, research, books and forthcoming conferences.
– seminars and conferences on topics of interest to stakeholders.

The Linguasphere Observatory

The Linguasphere Observatory [16] serves as a viewing-platform from which the linguasphere may be observed as a transnational system, and from which the situation of each linguistic community, however small,
may be seen in its local and global context. Its fundamental aims are to study and promote multilingualism, to encourage the role of international languages in the service of a multilingual world, and to monitor the linguistic rights of the individual.
Main Functionalities of Existing Web-based Observatories

According to the web-based observatories that we described in the previous section, in this section we will identify the common functionalities that these systems have. Depending on the domain of their observation and the scopes that they want to achieve, each of the described web-based observatory is presenting a different set of functionalities. As it is expected, we will focus our attention on the main functionalities that education observatories present. Before the presentation of the main functionalities we will illustrate the disaggregating we did by defining three dimensions that consist of different set of functionalities. The dimensions are the following:

- **Information Services**: consisting of services, which provide the capability to search the contents of the observatory for any new items added in the observatory or browse the library of items stored in the observatory.

- **Communication Tools**: consisting of specific tools, which enable users of the observatory to communicate and exchange opinions/ideas.

- **Resource Management**: consisting of functionalities, which enable the users of the observatory to upload, store and manage resources relevant to the domain of the observatory.

![Figure 19: Main Functionalities Dimensions](image-url)
Information Services

- **News**: A service describing any new about the observatory itself and/or its contents.

- **Search Engines**: Simple and advanced search in the contents of the observatory.

Communication Tools

- **Forum**: An online discussion group, where participants with common interests can exchange open messages.

- **Chat**: Real-time communication between multiple users over the observatory. Like a conference call using text instead of conversation, it is a bit like e-mail in real time. The text appears as it is typed on all users participating in the chat.

- **Wiki**: A web application that allows users of the observatory to add content, as on an Internet forum, but also allows anyone to edit the content.

Resources Management

- **Links**: A list with useful web links that provides interesting information available to the public.

- **Resource Management**: Resources about the domain of the observatory
Comparison of Existing Web-Based Observatories

In this section we try to make a comparison of the web-based observatories that we described in section 7. The comparison will be made according to the three dimensions of functionalities that we mentioned in the previous section.
<table>
<thead>
<tr>
<th>Web-Based Observatory Name</th>
<th>Information Services</th>
<th>Communication Tools</th>
<th>Resource Management</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>News</td>
<td>Search Engines</td>
<td>Forum</td>
</tr>
<tr>
<td>CEN/ISSS Learning Technology Standards Observatory</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>IDABC Open Source Software Observatory</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
</tr>
<tr>
<td>The Basic Skills Agency Observatory</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
</tr>
<tr>
<td>European Quality Observatory</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Public Population Project in Genomics Observatory</td>
<td>✓</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>“économie langues formation” Observatory</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
</tr>
<tr>
<td>Helios Observatory</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>LEONIE (Learning in Europe: Observatory on National and International Evolution) Observatory</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>POLE (Policy Observatory for Lifelong learning and Employability) Observatory</td>
<td>×</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>PASCAL (Place Management, Social Capital and Learning Regions) Observatory</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Linguasphere Observatory</td>
<td>✓</td>
<td>×</td>
<td>×</td>
</tr>
</tbody>
</table>

Table 2: Comparison of Existing Web-Based Observatories
From the table above we can notice that all existing web-based observatories provide information services (News and Search Engines) to their users except from the POLE Observatory. Furthermore, most of the web-based observatories provide a forum to their users and only one provide a chat (The EQO Observatory), but no one of the described observatories provide a wiki. Finally we can notice that all observatories provide a resource library to their users and most of them provide Links related with the domain of Observatory.
Conclusions

Summarizing this section we can notice that because of the existence of two competencies description models, we decided to create a joint model that selects elements from the current state-of-the-art specifications (the IMS RCDEO and the HR-XML). This new model, which we have called it CDM will be used for the description of the competences that will be held in the database of the TenC Competence Observatory. As a result the TenC Competence Observatory will have the capability to export and import competences description based on either IMS RDCEO specification or HR-XML specification.

Furthermore, a reference Competence Observatory that we can rely on does not exist. As a result, in order to design the TenC Competence Observatory we have to build on the common functionalities of existing web based observatories properly modified to meet the TenCompetence needs.
2.2 Specification of a Competence Observatory Tool

INTRODUCTION

According to the Review of Competence Models and Observatory Tools, we can say that a competence observatory can be defined as a virtual place that gathers observations about competencies and monitors the results by the use of the web.

The scope of this document is to present how the TenC Competence Observatory will be designed based on the Competence Description Model (CDM) and observatory’s functional requirements specified in the Review of Competence Models and Observatory Tools.

We are starting our design by presenting the user groups that the TenC Competence Observatory is trying to address. Afterwards we present a complete set of Scenarios of Use based on the targeted user groups and we define the main functionalities of the observatory which expand the basic functionalities that have been identified in the Review of Competence Models and Observatory Tools.

The main functionalities are leading us to the functional and non-functional requirements of the system and to the Use Cases, which are described via the use of UML diagrams.

Another critical design issue is the integration of the observatory with the overall architecture of TenCompetence; as a result we are trying to design the components of the TenC Competence Observatory appropriately, taken into account the architecture requirements of TenCompetence, in order to be able to integrate the TenC Competence observatory during cycle 2 of the project.

Moreover, we present the class diagram of the observatory, which is very important for the phase of implementation and finally we present an evaluation plan, which will be used as soon as a first prototype of the observatory is ready.
Targeted User Groups

In this section, we describe the groups that the TenC Competence Observatory tries to target. These groups are divided into two categories, which are described below:

- **Enterprises or Organizations**: this group is interested in defining job profiles for their employees. More specifically, an enterprise or an organization is trying to be informed about the competences that fit to the professions of its employees.

- **Individuals**: this group is interested in comparing their own competences with reference ones for their professions.

As a result, we can say that both Enterprises/Organizations and Individuals can be seen as members of “Communities” related with specific job roles who want to share experiences related to required competencies for a specific job role.
**Scenarios of Use**

In this section we present three Scenarios of Use in narrative form. The Scenarios of use, which are depicted below give a general picture about the main functionalities and the functional and non-functional requirements that will describe in the next sections.

**Scenario of Use 1: Search and Download a competence related document**

**Brief Description of the Scenario**

A non-registered user to the observatory wants to download a document, in order to be informed about the domain of the observatory and the scope of the observatory.

**Actors**

- **Primary Actors:** Non-registered User
- **Secondary Actors:** none

**Flow of Events**

- **Basic Flow**

  **Begin**
  The non-registered user enters the TenC Competence Observatory

  **Browses the resources area**
  The non-registered user browses the resources page and tries to find a document related with competences and the scope of the observatory

  **Download the document**
  The non-registered user finds the desired document and downloads it, in order to informed about the observatory and to decide if he wants to register to the observatory or not

- **Alternative Flow**

  **Use the Search Engine**
  The non-registered user uses the search engine of the observatory, in order to find the desired document. By using the appropriate keywords the non-registered user finds the desired document and downloads it.
Special Requirements

<None>

Preconditions

<Not exist>

Postconditions

- The non-registered user downloaded successfully the document
- The non-registered user cancelled the download procedure

Scenario of Use 2: Find out the Competences for a specific Job/Function

Brief Description of the Scenario

A registered user is a web-developer and he wants to know what he has to learn, in order to become better in his profession. He decides to enter the TenC Competence Observatory and find out the competences that the other users of the Observatory have suggested for his profession.

Actors

- **Primary Actors:** Registered User
- **Secondary Actors:** Peers (other registered users)

Flow of Events

- **Basic Flow**

  **Begin**
  The user enters the TenC Competence Observatory

  **Login**
  The user logs in to the observatory

  **Browses available job/functions**
  The user browses the available job/functions of the observatory and finds the profession of web-developers.
Browse job/function levels

The user selects the appropriate level (for example expert level) for the profession of web-developer

Browse competences for job/function level

The user browses the competences, which is related with the selected level of the profession of web-developer.

- Alternative Flow 1

User does not have a profile

If the user has not a profile the system will prompt him to create one

- Alternative Flow 2

Search the available jobs/functions

The user uses the search engine, in order to find the profession of the web-developer.

Special Requirements

<None>

Preconditions

<Not exist>

Postconditions

The user finds out the appropriate competences of the profession of web developer for a specific level

Scenario of Use 3: Create a Competence Description and discuss it with the peers

Brief Description of the Scenario

A registered user is a member of a big company and head of Human Resources Unit. He wants to add in the repository of the TenC Competence Observatory a competence about the profession of web developer, in order to share his experience with the other users of the TenC Competence Observatory
Actors

- **Primary Actors:** Registered User
- **Secondary Actors:** Peers (other registered users)

Flow of Events

- **Basic Flow**

  **Begin**
  The user enters the TenC Competence Observatory

  **Login**
  The user logs in to the TenC Competence Observatory

  **Create a new competence description**
  The user fills the form with the appropriate elements, in order to create a new competence description about web developers. He maps this competence description with a specific level for the profession of web-developers

  **Connect to Community**
  The user browses the job/functions and he connects to the community related with web developers.

  **Enter the Chat**
  The user enters the chat of the community and discuss with other users about the competence has just created. The other users advise him to change some elements of the competence description

  **Create a new version of the competency**
  The user updates the competence description taking into account the feedback from his peers

- **Alternative Flow 1**

  **User does not have a profile**
  If the user has not a profile the system will prompt him to create one

- **Alternative Flow 2**

  **Search the available job/functions**
  The user uses the search engine, in order to find the profession of the web-developer.
Special Requirements

<None>

Preconditions

<None>

Postconditions

- The user creates an appropriate competence about the profession of web developer
Main Functionalities

In this section we describe the main functionalities of the TenC Competence Observatory. The TenC Competence Observatory beyond the main functionalities that an observatory must perform and are depicted in the table below will provide competence related functionalities.

<table>
<thead>
<tr>
<th>Information Services</th>
<th>Communication Tools</th>
<th>Resource Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>News</td>
<td>Search Engines</td>
<td>Links</td>
</tr>
<tr>
<td>Forum</td>
<td>Chat</td>
<td>Resource Library</td>
</tr>
<tr>
<td>Wiki</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Links</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Basic Observatory Functionalities

These functionalities as we can see in the figure below are:

- Searching specific competences, and exporting them as XML files
- Creating competences descriptions
- Editing/updating competences descriptions

Figure 20: Competence Related Functionalities
The main functionalities that have been identified from the Review of Competence Models and Observatory Tools are presented below. These functionalities have been customized according to the domain of the TenC Competence Observatory

**Information Services**

- **News**: A service describing any new about the TenC Competence Observatory itself and/or its contents.

- **Search Engines**: Simple and advanced search in the contents of the TenC Competence Observatory.

**Communication Tools**

- **Forum**: An online discussion group, where participants with common interests can exchange open messages.

- **Chat**: Real-time communication between multiple users over the TenC Competence Observatory. Like a conference call using text instead of conversation, is a bit like e-mail in real time. The text appears as it is typed on all users participating in the chat.

- **Wiki**: A web application that allows to users of the TenC Competence Observatory to add content, as on an Internet forum, but also allows anyone to edit the content.

**Resources Management**

- **Links**: A list with useful web links that provides interesting information available to the public.

- **Resource Management**: A list with useful digital resources (document, presentations) about competences and the observatory itself
Functional and Non-Functional Requirements

User Categories

In chapter 2 we identify the user groups that the TenC Competence Observatory is trying to address. These groups can be mapped into three User Categories, defined as follows:

**Anonymous User**: an anonymous, not logged in / not registered user. Guest users (Enterprises/Organizations representatives or individuals) are presented a limited functionality. In order to acquire the rights to use basic functionalities of the TenC Competence Observatory the user must fulfil a form with a list of questions.

**Registered User**: the registered user (Enterprises/Organizations representatives or individuals) can have access to all the areas of the observatory. The registered user contributes competences and jobs/functions to the observatory and becomes member of communities related with jobs/functions, in order to share his experience with other users.

**Administrator**: the user, who is responsible for the maintenance of the system and for its proper operation

Functional Requirements

Analyzing the needs of the different users’ categories of the TenC Competence Observatory we conclude to the following functional requirements:

- **For Anonymous Users**
  - To register to the TenC Competence Observatory by defining their personal details like name, surname, email, address, personal web page and their special interests like the desired jobs/functions
  - To be informed about any new in the observatory
  - To have limited access to the Competences Repository of the observatory
  - To have the option to view the available jobs/function that the observatory includes
  - To search the observatory contents, in order to find information about it
  - To view links related with the observatory
  - To have access to a resource library related to the domain of the observatory
To log-in to the TenC Competence Observatory using an appropriate username and password.

- For Registered Users
  
  o To view and edit their profile
  o To be informed about any new in the observatory
  o To search the observatory contents, in order to find specific information
  o To view links related with the TenC Competence Observatory
  o To have access to a resource library related to the domain of the TenC Competence Observatory
  o To have a private space where they store their competences about the jobs/functions levels they are interested
  o To create new versions of the competences that they have in their space
  o To extract the competences of their space to XML format
  o To delete a competence from their space
  o To add a new competence to the Competences Repository of the observatory
  o To have the option to view the available jobs/function that the observatory includes
  o To create new jobs/functions and jobs/functions levels
  o To map competences to job/function levels
  o To register, connect and participate to communities, which are related with jobs/functions
  o To participate to the collaboration tools of a community (forum, chat, wiki), in order to exchange opinions and experiences with other users
  o To have the option to view the analytic profiles of the members of a community
  o To have the option to view the list of competences for a specific job/function level and to copy them to their space
• **For Administrator**
  
  o To be informed for any potential users of the observatory
  
  o To insert and delete news about the observatory
  
  o To browse or search about the registered users and see the analytic profile of the user and the interactions of a specific user with the system
  
  o To delete a user from the observatory
  
  o To insert and delete files from the resource library of the observatory
  
  o To insert and delete links related with the observatory

**Non-Functional Requirements**

The non-functional requirements specify how well the system must perform its actions. The non-functional requirements of the TenC Competence Observatory are divided into four categories as it is described below:

• **Usability**
  
  o The System should run on any color screen with a resolution of 1024 x 768 or greater.

  **Rationale:** To give a good overview of the system, it’s necessary to show the whole system in a convenient way (without vertical and horizontal scroll bars). This can’t be achieved in a small screen

  o The System should provide to the users the capability to navigate and operate the system easily

  **Rationale:** It is important that users learn to navigate and operate the System easily and effectively; the existence of context sensitive help facilitates that.

  o The News/Announcements of the System should be archived after sixty (60) days

  **Rationale:** It is important for the system to keep its users informed with its latest news/announcements. A new/announcement, which is more than sixty (60) days old, should be archived, in order to keep the News/Announcements section short and usable for the users.
• Reliability

  o In order to protect user’s data from getting lost, the state of user actions should be stored so the system should be able to recover them.

    Rationale: The System should not lose data when the hardware fails

  o User’s password has to be stored in an encrypted way and must be at least 8 characters.

    Rationale: The user’s password should be 8 or more characters long and encrypted, so as to maximize the system’s security.

  o The System should support logical deletion of data

    Rationale: It is very important for the System to support recovery of deleted data; the logical deletion of data facilitates that.

• Performance

  o On average, a response from the System to user inputs should take 5 seconds or less.

    Rationale: The average time for response ensures that the TenC Competence Observatory will be responsive and efficient to the user even for demanding queries. The average response time of 5 seconds is only guaranteed for users with download speed of at least 512 Kbit/sec

  o The maximum response from the System to user inputs can not exceed 60 seconds

    Rationale: The maximum time for response ensures that the Web Server (ex. Apache), which hosts the TenC Competence Observatory will execute appropriate all the user requests.
Supportability

- The System has to be able to run on a number of different operating systems, among which Windows, Unix, Linux

**Rationale:** Since the System addresses a wide range of users including Individuals and representatives from Enterprises/Organizations regardless of the computer system setup and/or operating system, the TenC Competence Observatory should run without any problems on any user setup.

- The System has to be able to import and export competences descriptions based on IMS-RDCEO and HR-XML specifications

**Rationale:** According to the TenC Domain Model, the TenC Competence Observatory must import and export competences based on the Common Competence Interoperability Framework, which will build on the current specs from HR-XML format and IEEE RDCEO. As a result, the TenC Competence Observatory has to be able to support both specifications (IMS RDCEO and HR-XML)

- The System should be available for everybody.

**Rationale:** The System should provide the capability for everyone to register and enter the System. An administrator should be responsible for the maintenance and the proper operation of the System.

- The System should be available both as a standalone system and as an integrated part of the TenC System

**Rationale:** According to the TenC Domain Model, the TenC Competence Observatory must import and export competence descriptions, as a result the TenC Competence Observatory is loosely coupled to the overall TenC System and the integration to the TenC System should be done in the level of “data exchange”.

TENCompetence – IST-2005-027087 - 79
Use Cases

In this chapter we present the Use Cases of the TenC Competence Observatory. First we present the Use Case for the whole Work package 8 in order to identify the role of the TenC Competence Observatory among the others subsystems of the work package. Afterwards, we present the detail Use Cases for the TenC Competence Observatory via the use of UML diagrams.

Basic Use Case (extracted from unified WP2 Use Case)

At the following picture is presented the Use Case diagram for the Work Package 8.

![Use Case Diagram for WP8](image)

**Figure 21:** Use Case Diagram for WP8

The work package 8 aims to develop models and tools to support the interoperability of formal and informal competence development programmes from different providers and from different countries.

Within this framework, the TenC Competence Observatory will be used as the system where the learner will retrieve information about the competences that must acquire for different
professions/jobs or functions. This will guide the learner to find the appropriate programme through the Learning Network to develop his competences.

**Detail Use Cases**

In this section we will utilize the Use Cases Diagrams in order to describe the functionalities of our TenC Competence Observatory that were presented in chapter 5. Use case diagrams are used to identify the primary elements and processes that form the system. The primary elements are termed as "actors" and the processes are called "use cases." The Use case diagram shows which actors interact with each use case.

In our case we have three actors:

- The Anonymous User
- The Registered User
- The Administrator

Below, for each of these actors we provide a diagram and for each use case of the diagram we provide a table, which contains information such as:

- Description: A short scenario that describes the use case.
- Actor: The actors participating in this use case.
- Basic Flow: A basic flow of events.
- Post Conditions: Conditions that must be fulfilled in order to achieve the corresponding act.
- Pre-Conditions: Conditions after the act.
- Include: Use cases that are included in the use case that we describe.
- Extend: Use cases where the use case that we describe is an extension of these.
- Notes: Useful notes about the use case.

**Anonymous User**

The following figure presents the use cases for the actor – Anonymous User (the description of all the Use Cases can be found at Appendix G)
Registered User

The following figure presents the use cases for the actor – Registered User (the description of all the Use Cases can be found at the Appendix H)

![Use Case Diagram - Registered User](image-url)

**Figure 23: Use Case Diagram - Registered User**
Administrator

The following figure presents the use cases for the actor – Administrator (the description of all the Use Cases can be found at the Appendix I)

Figure 24: Use Case Diagram - Administrator
TenC Competence Observatory Components and their Specifications

In this section we present the components of the TenC Competence Observatory and their specifications, based on the outcomes of the Review of Competence Models and Observatory Tools. The TenC Competence Observatory consists of the following components:

1. Competences Component:

This component provides the mechanisms for search/view competences and for Edit/Create competences. More specifically the component incorporates the following mechanisms:

- **Search/View Mechanism:** provides the capability to the user to insert specific criteria, in order to search and view specific competences descriptions

- **Edit/Create Mechanism:** provides the capability to the user to contribute competences description to the Competences Repository of the Observatory. Furthermore, the mechanism provides the capability to the user to create new versions of competences descriptions by editing already stored competences descriptions in the Competences Repository of the Observatory

- **Export to XML Format Mechanism:** provides the capability to the user to export competences descriptions to XML format, compatible with the current state of the art specifications IMS RDCEO and HR-XML.

2. Jobs/Functions Component:

This component provides the mechanisms for managing the jobs/functions of the Observatory. More specifically the component incorporates the following mechanisms:

- **Create/Update Mechanism:** provides the capability to the user to contribute Jobs/Functions to the Observatory. Furthermore, the mechanism provides the capability to the user to create new versions of Jobs/Functions by editing already stored Jobs/Functions of the Observatory

- **Map Competences Mechanism:** the mechanism provides the capability to the users to define the competences for specific jobs/functions levels.

- **Collaboration Tools:** the collaboration tools are used to support communication between the users of the TenC Competence Observatory. The collaboration tools include forum, chat and wiki
3. **User Management Component:**

This component provides the mechanisms for view/edit the users’ profile and for the authentication of users when they log-in to the Observatory. More specifically the component incorporates the following mechanisms:

- **View/Edit Users’ Profile Mechanism:** provides the capability to the user to view and edit his profile details.

- **User Authentication Mechanism:** this mechanism is used, in order to authenticate the users when they are trying to log-in to the Observatory.

4. **Information Services Component:**

This component provides the mechanisms for providing information services to the users of the observatory. More specifically the component incorporates the following mechanisms:

- **Links Mechanism:** provides the capability to the user to view a set of Links related with the domain of the observatory

- **Resources Mechanism:** provides the capability to the user to view a list of resources related with the domain of the observatory

- **News Mechanism:** provides the capability to the user to view news and announcements about the TenC Competence Observatory

5. **System Administration Component:**

This component provides to the administrator the mechanisms for the administration of the system and its proper operation. More specifically the component incorporates the following mechanisms:

- **User Management Mechanism:** this mechanism keep informed the administrator of the Observatory for any candidate users. The mechanism provides to the administrator the capability to approve or disapprove candidate users of the Observatory

- **News Mechanism:** this mechanism provides to the administrator the capability to manage the news of the Observatory (add/remove news)

- **Resources Mechanism:** this mechanism provides to the administrator the capability to manage the resources of the Observatory (add/remove resources)

- **Links Mechanisms:** this mechanism provides to the administrator the capability to manage the links of the Observatory (add/remove links)
TenCompetence Architecture Requirements for Integration at Cycle 2

The TenC Domain Model that was created in WP2 aims (among other objectives) to define the overall TenCompetence conceptual architecture. The TenC Competence Observatory within this overall architecture import and export competences based on the Common Competence Interoperability Framework, which will build on the current specs from HR-XML format and IEEE RCDEO. These two specifications are presented in details at the Review of Competence Models and Observatory Tools.

In order to ensure that the TenC Competence Observatory will meet the TenCompetence Architecture Requirements for integration at Cycle 2 we design the observatory to export and import competences based on the mapping between HR-XML and IEEE RDCEO specifications.

Figure 25: TENC Core Domain Model
This mapping procedure between IMS RDCEO and HR-XML has been described in the Review of Competence Models and Observatory Tools. The joint competence description model is called CDM and we will use it, in order to store the competences description in the TenC Competence Observatory Database. This would ensure that the system would have the capability to import and export competences descriptions based on either IMS RDCEO specification or HR-XML specification.

Summarizing all above the design of the TenC Competence Observatory responds to the requirements for integration at the TenCompetence architecture at Cycle 2.
Class Diagram

In this section we present the class diagram of the TenC Competence Observatory. The class diagram illustrates the classes along with their attributes and their relations.

For the diagram above we can notice that the class User is connected with relation Inheritance with classes Administrator and Registered User. This means that a user which is stored to the system database is either a user, who has fulfilled the registration form or an administrator.
The class administrator is connected with relation of Directed Association with the classes New/Announcement, Resource, and Link. This means that the administrator is responsible and can manage these classes.

The class user is connected with relation of Directed Association with the classes: job/function and competence because the competences and the jobs/functions are managed (created, updated) by the users.

In addition the class user is connected with relation of Usage with the packages Forum, Chat, Wiki. These packages represent the collaboration tools that the user can use, in order to communicate with other users of the system.

Moreover, the class Job/Function is connected with relation of Directed Composition with the class Job/Function since a Job/Function consists of several Job/Functions levels.

Finally the class Competence is connected with relation of Directed Composition with the class Proficiency Level since a Competence consists of several Proficiency Levels. The proficiency levels are mapped to job/function levels and as result the relation between the class job/function level and the class proficiency level is a Directed Composition.
Evaluation Plan

The Evaluation Plan for the TenC Competence Observatory will be based on three axis, as follows:

- **Assessment of system functionalities**: the users will evaluate the design of the TenC Competence Observatory. More specifically the users will evaluate if the functionalities of the Observatory have been implemented properly.

- **User interfaces and usability**: the users will evaluate the interfaces and the usability of the system. More specifically the users will evaluate issues such as: presentation of information, user-friendliness of the Observatory, easy navigation, organization of information, etc.

- **Impact of the system**: the users will evaluate the impact and the results of using the TenC Competence Observatory.

For each of the above mentioned dimensions we will define suitable evaluation means, in order to take feedback from the targeted user groups. This activity will start after the initial implementation of the TenC Competence Observatory prototype.
Chapter 3: OVERVIEW TOOL AND EMBEDDED DYNAMICS

3.1 State of the Art review for Competence Development Systems and Stimulus Agents

Introduction

To date, is still difficult for individuals, groups and organisations in Europe to get an overview of all the possible formal and informal knowledge resources, units of learning, programmes and learning networks that are available, and to identify the most appropriate one for their needs.

The problem arises when one attempts to locate suitable information in a given area. An illustrating example could be a researcher that wants to pursue a post doc in a specific discipline and wants to explore the various possible openings in universities across Europe. In addition to finding the best way to access and obtain knowledge without having to manually filter out content, the potential post doc candidate will also be confronted with a series of questions.

- Who could I access who has gone recently through an experience similar to the one I am going to embark into?
- Who could I access who can provide me advice on how to best proceed on developing the targeted competences?
- Who could I access who can provide me with the targeted competences in a “real-time” mode?
- Who could I access who can advise me on which document/site/programme is the most efficient/most pleasant way of developing the targeted competencies?
- Who could I access who can provide me direct or indirect access to the people that are listed above?
- Which type of access to all these people can I actually get?

The WWW has opened up immense possibilities for people to explore, search and access vast amounts of information from various sources. Furthermore, search engines are becoming the dominant way to filter out relevant content by specifying ones search through the use of keywords. Despite the success of search engines such as Google to help people
manage information within the internet, navigation remains a challenge especially for people who do not know exactly what they are looking for, and who’s search of appropriate and quality content is often a trail and errors process that often leads to dead-ends. As they exist today, the majority of search engines tend to return a number of related links and its relevance depends highly on the match between the terms entered and how the content is semantically organized. This approach of searching several terms and sifting through search results for suitability and quality can be extremely time-consuming. Additionally, a learner has the additional challenge of keeping track of ones research results, and to distinguish content which are interesting and worth pursuing from those that are completely irrelevant. Think of how difficult it is to keep track of the articles we as researchers read, book marking them and then retrieving those!

Moreover, search and overview tools do not provide access to people who produce or use this content and if these connections exist, as they oftentimes do, the point of entry to these people is usually a list-based directory. A directory-based approach presents information in a form of a static list of contact details, professional situation, past and present experience, and are poorly integrated to the current and future activities of each person as well as the range of resources each member has access to. With a directory approach, we cannot retrieve information quickly about who has taken the programme in the past, his perception, and his current situation and how best to contact him. Access to these additional, more contextual information can better guide an individual’s networking choices as an alternate form of knowledge search through people, i.e. who can I contact with the expertise I need and who will most likely respond.

For the purposes of the TENCompetence project, Task 8.2 will describe components needed to provide an overview of the possible formal and informal programmes that are available for users to develop their competencies. We have added an additional but equally important layer of facilitating access to the expertise and past and ongoing experiences of members within the network- as a form of knowledge search through others.

This review begins with models and tools related to a description of traditional portal-based approach to information search and the key features of such methods as well as illustrating examples. This is followed in section three by the proposition of a more interactive and dynamic approach to knowledge gathering and decision-making. This approach focuses on the organization, management and visualization of the social network within which much knowledge is contained in the form of previous experiences, contacts, opinions, expertise, etc. Section four includes a more detailed analysis of various search, matching and visualization techniques that may be used to help users navigate through the
formal and informal networks within the learning community and to identify relevant competence development programmes and other competence-related opportunities. We conclude with an analysis of how these tools may be adapted for use in TENCompetence.

3.1.1 Review of web portals and current methods for information search

Web portals serve as a point of entry for the collection, organization, search and diffusion of information. If designed with a community-perspective in mind, they can also serve as a social space in which users may share and exchange knowledge with one another.

The word portal originated from the Latin word *porta*, meaning door or gate. The Oxford dictionary defines a portal simply as a door or gateway, with a web portal as an “internet site providing a directory of links to other sites” (reference). These sites provide access to a vast amount of information, usually organized by topic items and including both basic and more advanced keyword-based search engines to better guide a user’s search for information.

Wikipedia further clarifies web portals as sites on the WWW that “typically provide personalized capabilities to their visitors”. They are designed to use distributed applications and various types of middleware to bring together services from various sources. Early examples include web directories such as America Online, Lycos, Yahoo and other search engines such as Excite, AltaVista and Hotbot, with which users may have access to a variety of topics, such as the weather, news, travel, food, culture, etc. In an attempt to encourage continual usage, these early portals were extended with features such as email, customizations and chat rooms. While many of these sites no longer exist, some, such as Yahoo! remain vibrant, due to continual development of its services around users needs, such as providing original content, personalized media experiences, the creation of groups and communities around special interests and greater functionality of its email services.

Portals are especially useful for government agencies which have a vast repository of knowledge and informational resources that they need to communicate to large audience. Increasingly, governments are looking to use portal themselves as a form of knowledge management. Within the United States, portal-based initiatives are sweeping the country as state and local governments work towards going online (Wagner et al, 2006; Newcombe, 2000). E-governments are among the largest webs in existences, based on the amount of information, size of its audience and number of information providers. When designed properly, they have been shown to be an effective way to efficiently provide better services for its citizens and improve governmental services (Gronlund, 2004). For example, within
many states, individuals can now, from their own home, download governmental and administrative forms, renew licences, schedule appointments, and keep up to date with changes in governmental, state and local policies.

More recently, portals have also sprouted up around different interest groups and communities. Community portals are similar to that of Yahoo and e-government sites in that it presents a structured view of relevant information. They differ in the sense that knowledge comes from a community that itself determines the relevance of content and collectively build up a common knowledge space. As such, knowledge within such communities is a collaborative process rather than a repository. Furthermore, the maintenance of such portals is based on principles of self-organization in which members themselves determine the nature, value and relevance of a particular contribution. This is evidenced by the rise Web 2.0 tools such as blogs, wikis, forums and social bookmarking, which places authorship and control in the hands of users, who collectively negotiate the emergence of relevant and interesting information (O’Reilly, 2005).

Despite the distinctions that can be made between information and community-based approaches, all portals share similar features. These include an interface that seeks to present information in an organized and intelligible way and a search engine to locate relevant information with links that lead from one content or resource to another.

3.1.2 Design challenges

The design and development of effective portals remains a challenge, principally related to the management of too much information, the coordination of different information sources, inconsistent terminologies, information overload and little maintenance of outdated knowledge (Wagner et al., 2006). More specifically, Wagner and colleagues cited the following key challenges of existing technological solutions towards building an effective portal, especially community ones which are based on contributions from a group of diverse users.

- Difficulty in extracting knowledge. It is difficult to extract knowledge from both documents and people. The first requires data mining and a sophisticated enough search engine to identify relevant information. This process is made more difficult with unstructured documents. Knowledge extraction from people, especially tacit knowledge, which include past experiences, opinions and expertise, is even more difficult as people often tell less than what they know or only offer up information when requested (Nonaka & Takeuchi, 1995). Compounded to this fact is that
semantic relationships between knowledge objects are constantly evolving and this poses challenging questions for the updating, interpretations and navigation of information.

- **Heterogeneous knowledge sources.** Here the challenge lies in creating linkages between different knowledge sources and objects, which are often represented at different levels of granularity and points of view, thereby creating inconsistencies and contradictions.

- **Limit to expertise.** Due to the vast amount of existing and new information, it is difficult for one single person or group to verify the legitimacy of each single piece of information or content that is present in the portal.

- **Non technical end user contribution.** Especially in community portals in which users are the suppliers of information, most of the contributions are provided in a form that does not take into account the technical complexity of annotating and semantic mapping of web pages to create meaningful links that will facilitate the integration of knowledge and information from many sources.

- **Difficulty in maintaining knowledge.** As knowledge volume grows, the task of managing and maintaining content, which includes categorization of new information, the sifting out and archiving of old, becomes increasingly difficult and prone to error.

- **Ambiguous web.** The web is a constantly changing environment, and this implies a change in the relationships among its resources. New content is constantly being added, and these have to be figured into existing relationships. Additionally, existing relationships themselves may be subject to change and classifiers have to adapt accordingly.

Based on these challenges the following section will describe some of the requirements when building portals community portals.

### 3.2.1 Requirements

#### 3.2.1.1 Easy access and navigation

Since the objective of such portals to facilitate the search for information, easy navigation through the portal is a key issue. This is enhanced by a search engine that helps structure a user’s search process. However, for inexperienced, first time users, the process of familiarization with the site and all its features and resources can be a daunting task.
Additionally, if these users are not familiar with the domain and do not know what terms to search for, their navigation often leads to irrelevant results. For these users, in particular, it would be more effective to first explore the portal space by browsing and this in turn has implications for the how the portal is structured. Additionally, richly interrelated presentation of information is important to guide a user from one content to the next.

### 3.2.1.2 Providing information through a community of users

The content as well as linkages between contents within a community portal depends on the user contributions. These contributions come in many forms and formats but the search and presentation for content needs to be independent from the way it was originally provided. Additional, the portal has to be adaptable and evolve according to the informational sources from users. As Stabb et al (2000) cautions “In real-world settings, one must neither assume that a uniform mode for information storage exists nor that only one particular conceptual level is adequate for structuring information for a particular community” (p. 76). The design of portals can benefit from the use of many-to-many technology that support open knowledge sharing with few technical demands. Such technology may include the use of wikis and tags as a bottom-up user-directed and a more lightweight approach- as opposed to fixed and elaborated ontologies- to building and structuring knowledge (Wagner et al, 2006).

### 3.2.1.3 Maintenance

Communities have to be maintained, with old content, or content that is infrequently accessed thrown out and new ones integrated into the knowledge space. This maintenance can occur at the level of administrators but this approach is time consuming and costly. Another approach would be to have users themselves monitor the quality and value of the content, with new “hot and relevant topics” emerging through actual users looking at the content or resource and referencing it, usually in the form of attaching a link or tagging it. Social bookmarking has recently been used as a self-organizing way for members in a community to reference and organize key sites they have viewed on the internet. Web pages are tagged with key words which in turn can be accessed by other users interested in the similar subject-reinforcing again the efficiency of knowledge navigation through the experience other people.

### 3.3 Community portals for competence and professional development

With respect to TEN Competence, we anticipate the learning network as a community portal, rather than a data repository, in which learners may access information as well as
contribute to the shared knowledge base. Consequently, the examples described below are those whose objectives are to manage a community’s access to information and opportunities related to competence development, career development and lifelong learning. We look specifically at their search function and what types of information can be accessed, exchanged and created from such portals.

3.3.1 US Navy Integrated Learning Environment

The Navy’s Integrated Learning Environment (ILE) is an integrated family of systems providing anytime, anywhere e-Learning and training via the Internet. Its purpose is to track learner performance, diagnose a learner’s strengths and weaknesses, create individualized training plans, provide reports on individual and unit performance and readiness, support scheduling of training and managing infrastructure and training assets.

ILE delivers and tracks training to all Navy personnel deployed around the globe via a single, web-based portal, the Navy Knowledge Online (NKO). Through NKO, ILE users have access not only to personalized e-Learning trajectories, learning resources and courses, but also to peers and experts within the NKO community. This networked community, with over half a million registered users in 2005, serves as a huge reserve of social resources for the advancement of collective knowledge. Additionally, features within NKO, such as chat via instant messaging, email, message boards, and networking spaces, are available to improve and stimulate communication, knowledge exchange and cooperation among users.

3.3.2 Educational Portal.com

Education-Portal.com (http://education-portal.com/index.html) is a directory that brings together colleges, schools, and career information to assist students make informed decisions about their education. These total to more than 1000 colleges, universities, and career schools across US.

The portal consists of articles written by portal staff that include general information about the school's history, a summary of the programs offered, and information about the campus and its surrounding areas. At the end of each article one can find the school's contact information including a phone number and the schools official website.

Articles on more than 400 career possibilities are included in the portal, connected to relevant degree classifications. They provide an overview and further details about definition
of careers, the relevant educational background they require, as well as statistical data about salaries and employment.

3.3.3 **Michigan Career Portal**

[http://www.michigan.gov/som/0,1607,7-192-29940---,00.html](http://www.michigan.gov/som/0,1607,7-192-29940---,00.html)

This site is a link to state and national employment, career, education, training, and business resources and services. There is a section dedicated to job seekers where one can post his resume, search job openings and browse all the current openings in Michigan State. Other resources offer links to America’s Job Bank, America’s Career InfoNet or the U.S Department of Labour.

One can browse and navigate by using search options based on key words, document type and category. One can filter searches to a limited amount of web documents by using the search engine's field syntax. This permits you to search for web pages' titles, urls and hypertext links.

3.3.4 **Healthcare Workforce.org**

[http://www.healthcareworkforce.org.uk/default.aspx](http://www.healthcareworkforce.org.uk/default.aspx)

National Workforce Projects provides support for the national and local workforce development. One can either select projects from a list or by choosing the first letter of the project one is looking for. The projects can be divided under two main categories – Knowledge Management and OD and Skills Development. In a specialized resource Center, one can find different written materials, databases, tools, guides as well as links to materials developed by professionals of the health care sector. A visitor of the webpage can also give his/her feedback by filling in an appropriate form.

A project particularly interesting in a Ten Competence Context is the UK-wide Workforce Planning Competence Framework that has been developed in order to identify the adequate competencies required within workforce planning. The framework provides a suite of competencies that are necessary to carry out workforce planning to enable the delivery of safe and effective care to patients and the public. The development of this framework has been carried out by NWP in partnership with Skills for Health and in consultation with a broad range of organisations. Individuals and organisations are encouraged to use this tool locally and to forward any comments or suggestions for improvements. This framework is now being taken forward to gain accreditation for National Occupation Standards (NOS) – once this process is successfully concluded it will be posted on this portal.
3.3.5 The Ultimate Training and Educational Portal for Career Development

http://www.tasl.com/

TASL is a training resource center/database for career/business. It includes the offerings of over 1,000 of the best universities, industry associations, media, and training companies.

By browsing the site one has the possibility to:

- Access online training
- Sign up for or request information on public seminars, industry conferences, continuing education and executive education courses, certificate and trade programs.
- Submit requests for proposals for on-site training and training related services.
- Order off-the-shelf training programs, simulations, and training management systems.

One can browse by product or by providers.

3.3.6 University of Leicester Student Portal

http://www.le.ac.uk/students/development.html

The University of Leicester offers to its current and prospective students a portal for personal and career development. The Frequently asked questions section help students to formulate what their looking for in the site and they are directed towards the links they are interested in. There are three main sections: getting a work experience, gaining other experience and getting a job. Careers service help users to identify their employability skills in order to become more competitive on the job market. Personal Development Planning is a structured and supported process designed to help students to reflect on their skills and to plan for their future development. Each academic department has a model for PDP, designed to meet one’s specific needs.

3.3.7 Quintessential Careers.com

http://www.quintcareers.com/

This is a portal in career and job-search advice with more than 2,500 pages of free college, career, and job-search content. There is a directory to help users formulate their demand and find what they need. A career toolkit will help with cover letters, resumes, networking, interviewing, salary negotiation. There is a comprehensive A-Z site index of all college, career, and job-search content.
3.3.8 The University of Northern Carolina Professional Development Portal

http://pdp.uncltl.org/content.php/mypdp/about/new.htm

The University of North Carolina Professional Development Portal has been created to fulfill the following objectives:

- Search across subjects, keywords, resource types, and list results by relevancy, title, or date.
- Browse all focus areas by subject term, resource type, or campus.
- Customize the PDP to emphasize the focus area content one is most interested in.
- Find colleagues by their specified areas of interest in the members’ directory or beside one’s regular search results.
- Use a streamlined submission process to submit one’s own resources to the editors.
- Subscribe to feeds of the most recent PDP entries for each focus area.

3.3.9 RMIT Professional Network Development

http://www.rmit.edu.au/browse/Information%20and%20Services%2FStaff%2FProfessional%20Development/

A Professional Development Network Website connects RMIT staff with professional development opportunities. Personal Development includes training, workshops, forums, mentoring or other services that assist in the professional development and their working skills. One can browse his/her options by theme, by date or by provider. By choosing specific links one will most likely find oneself on one of the Professional Development provider sites.

3.3.10 Chemistry. Org

http://www.chemistry.org/portal/a/c/s/1/home.html

The American Chemical Society provides a broad range of opportunities for peer interaction and career development, regardless of professional or scientific interests. ACS offers a variety of formats for recruiters and chemical scientists who want to expand their career options and gain career management skills. There are links to online job websites dedicated to the employment needs of the chemical enterprise.
Task 8.3

3.1 The evolution of competence and knowledge management towards more socially-oriented systems

In a recent review of knowledge management research and practices, Hong and Stahle (2005) noted the emergence of a new generation of knowledge management systems focused on the dynamic self-organization of knowledge and the creation of new knowledge and competences. This approach builds on previous generation systems which first emphasized locating, capturing and delivering knowledge, followed by the integration of concepts such as tacit knowledge, social learning and communities of practice toward knowledge sharing and transfer.

This shift toward a more socially-oriented perspective is mirrored within competence management literature. Most recently, competence development is mainly seen not as the management of existing competences but as an innovative learning process, which requires the management of competences as they emerge from ongoing practices and activities.

We also borrow from current knowledge management practices within the business realm to illustrate the importance of supporting the social dimension. More and more, companies are focusing on the importance of relationships and networks (Cross & Parker, 2004). The traditional aspect of the managerial role has taken a new dimension reflected in the so-called “post bureaucratic” or “network” organization. Mapping the awareness of “who knows what” and “who knows who” in a group gives members insights into the potential for members to tap into the expertise of their colleagues (Noria & Eccles, 1992).

As such, traditional companies are now observed to be experimenting with network design. General Electric is turning into the ultimate network organization: the boundaryless organization composed of a seamless network of relationships. Within such a company, members of the group are dispersed across different geographic sites and hierarchical levels and bring together different kinds of expertise and exploit the best expertise that is within the network.

Within such organizational paradigms, success depends more and more on relationship skills: how well one builds good relationships with peers, superiors, subordinates, groups, teams, customers, suppliers, investors and a multitude of others. Other companies such as Ericsson, IBM and others are practicing similar approaches.
Based on the direction of knowledge management literature and business practice, we would like to test the hypothesis that, within the realm of competence development, knowing about and having access to the social network can help with decision-making and inform targeted efforts to promote knowledge exchange among learners.

In order to accomplish this, a variety of social tools and methods are available to make more visible and accessible the social network as well as to promote user-driven contributions to the knowledge space.

3.1.1 Search and visualization of the social network

Knowledge visualization is the visual display of information that aims to further transfer insights, experiences, attitudes, values, expectations, perspectives, opinions and predictions by using various complementary visualizations. It is a key issue to make knowledge visible so that it can be better identified, accessed, shared, discussed, applied or be managed.

Many groups have discovered that an organizational chart can benefit substantially when viewed through a network lens. Visualization of who knows what and who knows who may help network members define what kinds of information need to be shared within the group and then to map each kind as a separate network. Network-based approaches have been used by companies to map and visualize the competences of a company. This allows for easier identifying the right person with the expertise to meet a particular need, as well as to find suitable matches to a job position. Additionally, a network-based approach has been used to manage the flow of knowledge through the organization.

Related to the visualization of the social network is its analysis. Having a graphic of a network people is only the first step. The second is to determine ways in which value may be introduced to such a visualization. This would include for example adding different layers of information associated with each individual (competences, expertise, professional interest, professional goals, programmes taken, learning path, etc). Additionally the network must be dynamics and adapt in real-time according to changes in a user’s profile.

One other thing to keep in mind is the idea that economic and social activities are not “pure” transactions but they are strongly influenced by the past and present social and cultural environment of the actors (Cohen & Prusak, 2001). People do not always look for the best knowledge or the greatest skill when they seek out the opinions and know-how of colleagues or partners. Rather, it is their own past experience and the practice and norms of their organization or group which dictate their networking choices. Reliability and comfort of established ties influence their knowledge seeking decisions, not pure pragmatism, along with the intrinsic pleasures of contact with acquaintances and friends (Cohen & Prusak, 2001).
3.1.2 Collaborative filtering for proximity “interest” information

Collaborative filtering systems are software systems which help Internet users find the more valuable and interesting information, aided by other people's ratings. For example a collaborative filtering or recommendation system for music tastes could make predictions about which music a user may like given a partial list of that user's tastes (likes or dislikes).

Recently a number of methods have been developed for the "collaborative filtering" or the "social filtering" of information (Resnick et al. 1994; Sharanand & Maes 1995; Breeze et al. 1998). The main idea is to automate the process of "word-of-mouth" by which people recommend products or services to one another. In everyday life, if a person is faced with a variety of options with which he does not have any experience, he will often rely on the opinions of others who do have such experience. However, when there are thousands or millions of options, like in the Web, it becomes practically impossible for an individual to locate reliable experts that can give advice about each of the options. By shifting from an individual to a collective method of recommendation, the problem becomes more manageable. Instead of asking opinions to each individual, one might try instead to determine an "average opinion" for the group. This is based on the underlying assumption that a person would prefer to hear the opinions of those people who have similar interests and tastes rather than those that do not.

The basic process behind collaborative filtering systems is the following:

- A large group of people's preferences are registered
- Using a similarity metric, a subgroup of people is selected whose preferences are similar to the preferences of the person who seeks advice or
- A (possibly weighted) average of the preferences for that subgroup is calculated
- The resulting preference function is used to recommend options on which the advice-seeker has expressed no personal opinion as yet

The typical application of this method is toward the recommendation of books, music CDs, or movies, as exemplified by Amazon.com. However, this method can also be applied to the selection of documents, services or products of any kind. The main bottleneck with existing collaborative filtering systems is the collection of preferences (Shardanand & Maes 1995). To be reliable, the system needs a very large number of people (typically thousands) to express their preferences about a relatively large number of subjects or items. This requires quite a lot of effort from a lot of people. Since the system only becomes useful after a "critical mass" of
opinions has been collected, and people will not be very motivated to express detailed preferences in the early stages (e.g. by scoring dozens of music records on a 10 point scale), when the system cannot as yet provide immediate value to them.

3.1.3 Rating mechanism

The problem of ensuring a user’s continual participation is very important for all online communities. A user’s investment in any activity is a delicate balance of cost and benefit- not only of the potential value that can be derived from a transaction but also the level of trust and confidence that the transaction will reap its reward. (Thibault and Kelley, 1952)

One way to guide a user’s decision to engage in an activity is to present them with resources that have explicit ratings from other users. This may in turn provide assurances as to which option to follow and in turn, rate the quality of that option.

Our hypothesis is that adaptive reward mechanisms can improve the quality of contributions because it encourages the users who have a good reputation for sharing high quality resources to share more. Additionally, a rating system serves as a guide for others to identify which resources might be more reliable, insightful and useful compared to others. Through this process, it is expected that quality contributions and resources will emerge based on use and favourable ratings, while low quality contributions, will, over time, be sifted out and purged from the knowledge space.

The most well-known e-commerce rating system belongs to eBay, the largest and most successful Internet Auction provider enabling transactions between private parties. EBay’s users buy and sell items that are varied, with an equally diverse group of vendors selling similar items. An immediate question a buyer faces is, *which buyer do I buy my item from among a list of possible vendors?* As in any transaction, in which both parties are mutually involved and have something to gain, trust plays a big role who transacts with who. A buyer who has had a positive experience with a vendor will more likely return to that vendor if all other factors are equal (price of item, delivery date). To foster trust in an environment in which buyers and sellers do not have face-to-face contact, eBay has created a system by which the market participants rate each other after each transaction. This method helps users identify easily which vendor or buyer to go with by providing assurances from satisfaction ratings as well as more specific feedback by previous customers or a vendor. For example, if a vendor has been negatively rated for non-delivery of items or late delivery, this would deter new buyers from engaging in a similar transaction. Likewise, if a buyer has been rated poorly for non-payment, this would likewise deter a seller from continuing with the transaction.
Vendors themselves are expected to maintain a high level of service as negative ratings may be detrimental to their pool of potential buyers.

Ratings have proven to be extremely powerful tool toward achieving a self-organized, self-regulated transaction community, so much so that more sophisticated electronic commerce rating solutions have emerged (Noy, Guha, Musen, 2006). These include those that incorporate features such as multiple criteria (e.g., Bizrate), network of trust (e.g., epinions.com) and sophisticated statistical analysis (openratings.com).

3.1.4 Source Credibility theory

Related to user rating of content and resources is the source credibility theory as developed by Hovland et al (1953). According to the theory, perceived trustworthiness and perceived expertise as the main dimensions of a source’s credibility. The higher the trustworthiness and expertise a source is perceived to have, the higher will be the importance given to information coming from that source.

3.1.5 User classification

The proliferation of online communities (OCs) may lead designers and researchers to the conclusion that the development of custom-made communities for particular purpose is straightforward. Although software providing basic community infrastructure is readily available, it is not enough to ensure that the community will “take off” and become self-sustainable. A critical mass of user participation is necessary. Besides, the quality of the resources shared by users is crucial to the sustainability of the community. Therefore, to make OCs more self-sustaining and long-lasting, a new mechanism is needed to measure and monitor the quality of user contributions, elicit the ones of high quality and restrict the overall number of contributions. The hypothesis is that such a mechanism will stimulate users to contribute when and what is most useful for the community at the moment, thus achieving a level of activity that makes the community sustainable and avoids the “information overload” in OCs. (Cheng, Vassileva, 2006)

3.2 Existing tools

This section describes existing tools that focus on visualizing the social network and the resources contained within it. Additionally, emphasis is placed on tools that place the control of knowledge sharing and creation in the hands of the community of users. Most of the tools mentioned draw from Web 2.0 philosophy of bottom-up user driven self-organizing social network-based methods for knowledge work.
3.2.1 Social Networking and collaborative filtering tools

3.2.1.1 Friendster (social networking)

“Friendster (http://www.friendster.com/) is an Internet social network service connecting people in virtual communities through common interests. It demonstrates the small world phenomenon, which states that that everyone is connected to everyone else through a countable number of connections, Friendster works by having people explicitly articulate their social network, present themselves through a Profile (interests and demographics), post public Testimonials about one another, and browse a network of other people.”

“Friendster has seen success for creation connections among like-minded people on the internet, which is itself a vast reserve of many individuals. However, it has recently a decline in membership due mainly to poor customer service and strict policing of user profiles”.

3.2.1.2 Ryze.com (business networking)

Ryze (http://www.ryze.com/) is based on the same principles of Friendsters, except that the objective is not social but professional networking. Members of Ryze post information and an optional picture, as well as descriptions of their careers for free. "What I have” and "What I need" sections let members be creative and humorous. Inviting new members is easy with the help of an an Outlook address book importer. Members can also locate existing members to ask them to become first-degree friends. Search capabilities for locating members are basic and include keyword searches to match titles, interests, and regions.

"Ryze keeps networks tight, with "friends of friends" for business contacts. However, unlike Freindster, its editing feature is all-or-nothing: you can't block members while maintaining them as contacts. Alternatively one can selectively disclose contact information, like e-mail addresses and phone numbers, to individual members, allowing one to make contacts while still maintaining some degree of privacy.

Other community features include threaded general discussions for a variety of forums and a simple messaging client, as well as an address book of frequently contacted friends. And one of the more valuable feature within this community is that members can post invites to events for in-person networking. Many major U.S. cities have upcoming Ryze events. You can which one can RSVP online as well as view lists and photos of attending members.”

Reference: http://www.pcmag.com/article2/0,1895,1418687,00.asp
3.2.1.3 LinkedIn (business networking)

“LinkedIn ([https://www.linkedin.com/](https://www.linkedin.com/)) is another business networking site with more than 5 million registered users, representing 130 industries. It is intended to be used to find jobs, people and business opportunities recommended by the user’s direct contacts, or by individuals connected to a contact at the 2nd or 3rd degree.”

“All relationships on LinkedIn are mutually confirmed, and no one appears in the LinkedIn Network without explicit consent. A common option for beginners is to first search for current and former colleagues and contacts already linked up to LinkedIn. An added feature lets users compare Outlook address book against a list of current members, expediting the process of inviting people from the outside and building ones business network from the ground up.”

3.2.1.4 FOAF (machine readable web pages)

FOAF ([http://www.foaf-project.org/](http://www.foaf-project.org/)) is part of the WWW Consortium's semantic web development, based on the W3C-recommended RDF (Resource Description Framework) and XML (eXtensible Markup Language) standards. It is an attempt to provide machine readable metadata of content stored about an individual, so instead of having to fill in a profile for each new site, With FOAF, any person can post a page containing whatever personal details which can in turn be read by any computer.

3.2.1.5 MySpace

Launched officially in January 2004 after a four-month public beta test, the social-networking site MySpace.com ([http://www.myspace.com/](http://www.myspace.com/)) already has a staggering membership of 22 million, with two million new members joining per month, according to online market researcher comScore Media Metrix.

“MySpace is described as a free platform for personal websites. Teens can communicate with friends in school, keep in touch with distant friends and link up to new friends with common interests. Especially used by teenagers, the site has become a secondary e-mail account, users post photos, type blog entries, musicians upload songs, photos, and biography information. There are also MySpace groups, subset communities that unite users by their interests. And just about everything that’s posted on MySpace can be commented on by another user.”
3.2.1.6 Facebook

“Facebook (http://www.facebook.com/) is a social directory that enables people to share information. Launched in February 2004, Facebook provides users with access to the information that is most relevant to them. People with a valid email address from a supported college, high school or company can register for Facebook and create a profile to share information, photos, and interests with their friends.

What makes the site unique from networks like Friendster and MySpace is its exclusively academic focus, with an impressive membership of 7 million from more than 2,100 universities and 22,000 high schools. According to a report xxx, it is now the seventh-most-trafficked site on the Net, valued at over $1 billion. While other online communities are rife with poseurs, Facebook members use their “.edu” e-mail addresses; as a result, there is an inherent social pressure to be genuine.”

3.3 Search and visualization tools

Classical search tools have proposed for twenty years the same presentation of their results: an interminable list of page descriptions to be further refined by more specific keywords. It can be time consuming to evaluate a list of resources in a subject especially if the person does not have any competences in that area. Google for example is based on keyword match and a hyperlink database and is highly successful due to the organization of content as well as some recent development to enhance its capabilities.

Google’s functions have been extended to better meet user needs through Google Scholar, which provides a simple way to broadly search for scholarly literature. From the Google Scholar site, users can search across many disciplines and sources: peer-reviewed papers, theses, books, abstracts and articles, academic publishers, professional societies, preprint repositories, universities and other scholarly organizations. Scholar also facilitates the exploration and discovery of related material and resources based on their citation links. Researchers may discover other articles unknown to them by exploring the list of papers that have referenced the original article. Additionally, an article that has been referenced many times can be deemed more pivotal and useful than an article with little or no references. This method of cross-referencing (making connections between content) is a highly effective way to further guide users in their knowledge search through the multitude of search results.

3.3.1 Kartoo

Kartoo (http://www.kartoo.com/) is a French company which specializes in the dynamic representations for both search and knowledge and competence management purposes.
Kartoo’s many cartographic projects enable users to “see” a variety of knowledge representations in the form of network maps, cartography by process, cartography with semantic clusters, cartography in virtual universes or 3D spaces of isometric representation.

One of the advantages of Kartoo’s cartography is its capacity to synthesize information. It is grafted easily with one’s search tool and draws data maps that enable users to sort information easily, personalize and share it. The map has the capability to synthesize 30 documents per map and much more with “clustering”.

Additionally, the interface privileges the graphic objects to text- as a form of concept mapping similar to how the brain stores knowledge, in the form of clustering and connections. Furthermore, the map is interactive; when the mouse passes over an object its complete description appears with possibly a label. Lastly information is gathered in clusters for example the pages of the same site are represented by a pictogram that can be spread.

The data visualization interface is made in Flash MX and is compatible with all recent internet navigators. It fits very easily in any HTML page. This interface questions the server to obtain an XML flow of data and draw the map.

This method of knowledge representation allows for the exploration of content, whereby users may see how knowledge assets are related to one another through visualizing the keyword and other terms related to it. Additionally, the side box of the search engine presents a list of related search clusters. This can further help support a user’s discovery of knowledge.
Although Kartoo’s search engine is still a little clumsy (it is still in the beta testing stage), its underlying approach is one worth exploring as it tries to mimic the process by which the brain works - i.e. through the form of associations.

Other Kartoo projects for private companies have seen more visible results. One example is the design of a visual competence management system for L’Oreal in which the competences and expertise profile of all the employees of a company are represented in the form of a map. This tool has been useful for managers to identify the best person for an upcoming position and for peers to identify other peers with the expertise to address their knowledge related needs.

Yet another project involves the mapping of a social network in concentric circles. Users have various means to locate the person that best matches his interests. This begins with a general query, e.g. find all those who like soccer, which will then visualize the members in the network which fit this criteria. A further search of who live in my vicinity (5miles radius) reduces the original search result to a smaller number. This process of refinement and precision can continue until the user has found the person who has meet a list of criteria for a game on Sunday night at the neighbourhood park. Additionally, clicking on the person icons will pull up a profile, as well as contact details.

**Database visualization for UNO:**

The search interface developed for the UNEP presents the results in the form of clusters (page regrouping), but also specifies the search using precise criteria from the database. A safeguard system memorizes profiles of tool use.

**Search tool in CVthèque for Ubisoft:**

The map represents people of which the CV answers the search criteria. The closer the pictograms representing the people are on the map, the more the profiles resemble each other. A specific dictionary system makes it possible to launch parallel requests with abbreviations or the company's technical internal vocabulary for a maximum relevance.
Visualization of a newsgroup:

Debats.ch, is defined as "a site where one speaks about everything and nothing, but especially about everything!". The cartographic search tool of the site is particularly useful to find a discussion. The chosen solution: to graft KartOO Visu over the existing engine (that of phpBB).

Visualization of social networks:

Here is a demonstration of our KartOO Visu technology applied to the visualization of social networks. In this example, members of the same club wish to widen their circle of friends. However, visualization can also apply to a company with a network of people connected by competences or projects...

3.3.2 Liveplasma

“Liveplasma (http://www.liveplasma.com/) is a site that helps people find movies and music related to those that they already know or like. The search and visualization engine graphically "maps" a user’s potential interests. A search for music by Coldplay, for example, brings up a graphical representation of what previous customers of Coldplay music have purchased, presented in clusters of circles of various sizes. The circle sizes reflect the popularity of the artists in relation to other musicians. The bigger the circle, the greater the popularity of that band. The circles are clustered around orbits representing groups of customers with similar preferences.”

Another development under way is matching customer tastes across Web businesses, using knowledge of a customer's tastes in music to try to sell them books, for example.(like in amazon.com)
3.3.3 Bestiario

Although there is no search function associated with Bestiario’s ([http://www.bestiario.org/bestiario.html](http://www.bestiario.org/bestiario.html)) Flash-based visualization of it’s talent network, we thought it interesting to include, especially for it’s dynamic approach to representing people information. First, the picture associated with each individual personalizes the network. Furthermore, a first glance of the network tells a user general information about how the network is organized, in this case by the different areas within the visual arts domain. Clicking on the person’s picture will in turn pull up a profile box, listing the individual’s competences across several areas as well as contact information.
A second visualization within Bestiario is the mapping of the relationships between different areas of work within this organization. This allows for a fairly easy bird’s eye view of the range of areas covered by this organization.

However, it is limited in terms of information depth, it would be interesting to consider a second level linking the individuals to knowledge resources and assets- a further drilling down to other related information. For the purposes of TENCompetence, we envision a concept map representation of members within each learning network. Each node (which represents a member) will be the point of entry to other information associated to the member, be it his or her profile, or past, ongoing and future competence-related plans, relationship to different competence development programmes (either as a past, present or future student, comments and feedback for courses taken, etc). Additionally, current Bestiario maps, although interactive, are static in that they represent fixed information. What we would like to explore is the development of real-time representations of people network information, which change according to updates to a user’s profile, portfolio as well as ongoing behavior and interactions within the TENCompetence space.

3.4 Rating mechanism

3.4.1 Manyworlds

“The editors of Manyworlds (http://www.manyworlds.com) “mine” top publications and websites on a regular basis. From these, they select the highest quality material and review it, while ranking and rating it for quality and relevance. They also connect each material to other resources in the knowledge network and so provide additionally related content.

ManyWorlds.com is organized as a network of assets that have different levels of relevancy to each other. The result is a powerful, context based knowledge base that provides more relevant information to the user based on his explicitly tagged interest as well as information gathered through his exploration of different MyWorld resources.”

Features available for helping users organize their information search: subscribing or unsubscribing to updates in this topical area, printing the introduction, or saving the content into MyWorld or linking to the content.

Users can also use the interactive feature “Related areas” to find other topics similar to the one he is looking at. By moving the mouse across the image, and at different degrees of relevance, new interest areas will be listed.
"As a registered member of the site members will be able to cast their rating of the quality of a piece of material. Using the voting buttons members have a choice of rating levels ranging from Fair to Excellent. The original editor's quality rating will show, as well as a 'Community' rating that averages all votes from our users. Registered members can also post a comments and discussion points for each piece of document and these will be visible and accessible for follow up by other members."

3.4.2 Slashdot

Slashdot (http://slashdot.org/) is a technology oriented news site and forum that is updated daily by site editors. It is a website that generates a lot of traffic and has a high rate of user comments. Slashdot users offer summaries and reviews of stories and other websites. A user’s option to post anonymously is important.

“To prevent abusive comments, the editors have created a moderation system. A given comment can have an integer score from -1 to +5 with qualitative descriptors such as insightful, interesting, informative, funny, not relevant, etc. Any regular Slashdot reader fulfilling certain usage and contribution criteria (logged in, regular reader, long time readers, willing to serve as a moderator, positive contributions) may be eligible to become a moderator. A variety of factors weigh into this role assignment, but if you are logged in when you browse Slashdot comments, you might occasionally be granted moderator access."

The way content is judge by the community as valuable is based on its ratings. Similarly, the way an individual member is judged to be a positive contributor is through the accumulation of karma points. Karma is structured on the following scale "Terrible, Bad, Neutral, Positive,
Good, and Excellent." If a member is rated as having Positive, Good, or Excellent karma, it suggests that he or she has posted more good comments than bad, and are therefore eligible to moderate. Karma points are a reference for how a member’s comments have been moderated in the past. If a comment post is moderated up, karma ratings will rise. Consequently, if a comment has been moderated down, karma ratings will fall.

### 3.4.3 Digg

Digg ([http://digg.com/](http://digg.com/)) is similar to Slashdot except that content selection is not overseen by a group of editors. Rather, the decision of relevant information lies in the hands of readers, who can view all of the stories submitted by fellow users. Once a story has received enough “digs”, or positive feedback based on relevance, quality and value, it appears on Digg’s front page. All content and access to the site is free but registration is compulsory for promoting and submitting stories as well as commenting on submitted articles. Digg users are able to rate other user’s comments and this ensures that spam and offensive comments stay virtually invisible. User comments can be ‘dugg’ which can make a comment more visible and ‘buried’ making a comment less visible.
3.5 Social bookmarking

3.5.1 del.icious- social bookmarking site

Created as an alternative to the browser ‘favorites’, del.icious (www.del.icious.net) is an internet-based bookmarking site, allowing users to bookmark different internet pages and to organize these pages by giving each a tag name, or keyword.

The objective of social bookmarking is to help users better organize information gathered from the net and to more easily retrieve these links when needed. Additionally, users can discover other related links through the bookmarks of others. For example, if I am searching for an apartment and have a link to an apartment agency, and this link has been tagged by other users, I will be able to access the list of links created by other users to discover other apartment agency sites, without having to conduct the search from scratch (information seeking through networking).

3.5.2 Connotea- resource and news community for scientists

Built off del.icious, Connotea (www.connotea.com) is a social bookmarking/tagging site with a better visualization interface, e.g. topics with more tags appear in a larger font. Like del.icious, Connotea’s objective is to help filter or discover news through the effort/trails of
others. With one glance, a user new to the site can tell what the current ‘hot topics’ under discussion are. In the example below, ‘Avian flu’ is currently at the center of discussion. Additionally, users can also discover other related topics by accessing the ‘bookmarks’ of others. Looking at Bob’s bookmarks on Avian flu may then lead to other related articles or other related topics.
3.5.3  Ning- community site for creating and sharing social applications

As a final social bookmaking example, we mention Ning (www.ning.com) which is an attempt to consolidate the different social software programmes available in a single space as well as allow for the creation and sharing of new social applications. Ning is built on the principles of social networking, social bookmarking, active knowledge exchange and contribution. Users can create, share and use the social applications of others. These applications are tagged which serves a double function of retrieval (as well as provide usage information represented in the browsing section which lists the most popular applications, most popular users, etc.

Although the website is still new, it represents a trend towards more integrated services, such that a user may have, within one space the organization of different services he uses, such as uploading photos and movies, social networking, email, chat, etc. For the purposes of TENCompetence, this implies first identifying the needs of users- what are the necessary services they would like, and providing these as a first step, taking care not to overload the interface with too many features, function and content. Complexity and added functionality can be added at a future time as user needs evolve. Additionally, it is important to support the evolution and emergence of pattern of user interest and needs and to represent these changes based on real-time use (i.e. the emergence of topics of interest will change dynamically as a result of actual use= living information space).

3.6  Integrated knowledge and learning portals

3.6.1  Knowledge Board

Knowledge Board (http://www.knowledgeboard.com/) is a self-moderating knowledge community with a wealth of resources as well as collaborations around knowledge management and innovation (though not limited to). Informational resources include bibliography, journal, networks, library, latest news, while social resources include groups, COPs, projects, etc.

New users are asked to fill out a profile, which is then made visible to the community. Additionally, a moderator from one of the groups will, based on the details of the profile, actively invite a member to join the group. Principle features within this community are the self-organization of its members and the active exchange of knowledge. Additionally, there are collaborations among members with surveys to capture the expertise within the network. There exists even a joint creation and publication of a book on knowledge management by members of the Knowledge Board community.
The search for KM-related resources is conducted through browsing the section of the latest articles targeted advanced searches is available through a keyword search.

Users can also search for members according to interest areas and geographical locations. Contact can be done through sending a message through the Knowledge Board. Contact with one another is conducted through the forum posts as well as comments made to articles.

However, what is and comments, current forum conversation, and new documents to the library. More still missing is the integration of people knowledge and the contents of the knowledge base, although the discourse within Knowledge Board appears to be quite high level and vibrant as members discuss and exchange and extend ideas about subjects they are interested in.

3.6.2 Academici.com- Academic social networking and collaboration site

Academici ([https://www.academici.com/](https://www.academici.com/)) is a contact management system focused on connecting people within academia. The site is accessible in 15 languages.

It’s search function includes a general search for members using different categories or criteria, such as location, interest, needs, and wants. More interesting is the power search which allows a member to list other members who have recently viewed one’s contact page, profile, company homepage, and homepage of one’s former companies. Additionally, members may also search contacts of one’s contacts, members belonging to the same organization, university, who know several of one’s contacts etc.

The site includes a group page with forums on different subjects.
Stimulus Agents

1. Introduction
The main objective of 8.3 is to develop and test models and software agents to stimulate the pro-active sharing of programmes and the underlying learning activities and resources among users. After describing models and policies and tools to stimulate the pro-active sharing of learning and knowledge resources among users, we will try to define the features to adopt of collaborative behaviors within the networks that will be supported through simulation, in the form of games.

We will first identify methods and tools for agent-supported simulations, and in particular, for how social agents may support the knowledge worker in the whole knowledge management cycle. The task will continue with a description of the use of deep user modeling to provide the basis from which agents will deliver more personalized and value-added support. The task concludes with a framework for integrating simulations, social agents and policies into the network.

Our research is guided by the following three questions:

1. How collaborative tools will help us in sharing, improving and evaluating ideas systematically across teams, companies and networks?
2. What is the appropriate way to connect to the best people around and make optimal use of their competencies and improve ideas through truly collaborative workflows that will raise our cognitive capacity?
3. How can we use game dynamics directly in knowledge creating processes in order to enhance collaboration and boost creativity?

2. Models and methods
This section discusses the models and tools to facilitate the pro-active exchange of knowledge of a community of users. It will then explore alternative approaches to the enhancement of the knowledge seeking process, in particular, focusing on approaches based on a ‘learning by doing’ philosophy.

2.1 Collaborative learning and the exchange of knowledge
The essence of collaborative learning is that collaborative knowledge construction, coordination of different perspectives, commitment to joint goals, and shared evaluation of
group activities enable a group to create something that goes beyond what individuals could achieve alone. Free collaboration, however, does not systematically produce learning (Dillenbourg, 2003) and has to be effectively managed and supported.

This section will address the following questions:

1. What are the mechanism behind the sharing and exchange knowledge- social exchange theory.
2. What are the determinants of knowledge exchange? Motivational, individual, competence-related factors, value.
3. What are the barriers to knowledge exchange?
4. What are some of the models and methods use to facilitate knowledge exchange?

2.2 Simulations and learning by playing

This section will explore more alternative approaches to simulating the pro-active exchange of knowledge. Simulations, in the form of games, provide a learning-by-doing approach that may guide users toward discovering the social network structure and networking opportunities within competence development and management systems. Serious games have been in the market for a number of years, and have played a significant role in training activities in certain sectors, notably those in defense and aviation. Driven by falling technology costs, rising technological capabilities and changing attitudes of users, serious games are quickly moving into other sectors as serious tools with business relevance.

Game-like processes and systems have been used to involve a very heterogeneous target population in gradually becoming more aware and more willing and able to explore collaboratively and playfully new forms of knowledge exchange and interactions. Games may be used for efficiently “connecting” diverse and distributed people (as well as groups, networks, organizations, communities) and supporting proactively the identification of potentially high-value matches, and the gradual development of collaborative relationships. Games can also serve as interaction structures that guide players in the joint creation of meaning. If interaction structures are designed properly, players may be confronted or presented with collaboration opportunities, which if accepted may lead to the exchange and creation of knowledge, and the generation of value both at the individual and group level. And value creation is essential if such games are to succeed and to be broadly used in business and collaborative environments.
In fact, developing realistic ‘games’ enabling users to experience complex situations involving people and interactions in social contexts is one of the most challenging frontiers of education, because technically it enables active experimentation with advanced eLearning technologies such as distributed 3D. Conceptually it involves the development of ‘Learning to Learn’ and ‘Learning to Change’ competencies whose complexity has been explored extensively within the individual and organizational learning literature, and which is, for instance, at the core of the work of authors like Argyris and Schoen. Within the educational contexts, games have been successfully and extensively used to develop the competencies of managers, engineers and decision-makers in top business schools (such as MIT, Stanford, etc.) in managing change and innovation in different types of organizational contexts.

A concrete example of a learning experience which can be classified as a SmallWorld Simulation is the ‘EIS Simulation’ which has been widely adopted over the last few years to substitute or complement traditional ways of teaching change management competencies to engineering and management students, as well as to experienced executives.

The objectives (see Figure 1) of such simulations are to:

- Gradually increase the level of familiarity of each user with a specific space or feature of the overall system;
- Increase the value perceived by each user from using the system by locating and suggesting the ‘exploration’ of valuable spaces, knowledge assets and members: and
- Gradually increase the level of participation/involvement of each user.

![Figure 1. Change process within simulated games](image)
The backbone of such simulations is the experience of a complex fabric of relations that is found within any organized groups. These simulations to provide a risk-free space within which people may explore and discover the value of the social networks as well as experiment with negotiating through the different relationships weaved into it. Network dynamics include both formal and informal ties which has consequences for those who easily accessible and those that require a little more networking before access may be permitted. Through interactions with simulated characters as well as other players, individuals may learn about themselves, their own networking experiences and styles, the value of interpersonal relationships towards the access of knowledge, and how networks and networking function.

Based on the research on simulations, we propose developing a similar simulation-based learning experience for TenCompetence users. We are particularly interested in social simulations that consist of various human interactions involved in pursuing competence-related goals, particularly, those related to professional and career development. Within such simulations, participants function as members of some group, and are faced with a problem, complimented with a mission. Participants, in their roles, attempt to complete the assigned task within a social milieu. Actions performed by the players set in motion different interactive processes. Within such processes, players may experience frustration, pride, rejections, acceptance, cooperation, conflict, anger and other emotions as they attempt to achieve their goal.

This simulation will consist of a network of professionals within a field, with simulated characters, each with a competence profile as well as connections to competence development opportunities. Users playing the simulation will be given a mission that will launch them into an exploration and experimentation with social network space and its features.

We anticipate the impact of the simulations to be three-fold:

- Users will become familiar and adapt to the virtual environment. They will do so by gaining an understanding of social networks, developing navigation skills, and discovering system spaces and their communicative and collaborative features.
- Users will undergo socialization on a continual basis as the simulation assists them in forming connections among people.
- The gradual adoption of ‘desired’ behaviour, i.e. transforming users from lurkers to active contributors.
Within any professional field, the ability to network and to navigate across networks in order to discover knowledge and learning opportunities is critical for both personal and professional development. Knowledge workers often depend on the people they know to help guide or direct their knowledge search. Furthermore, a knowledge worker is also part of a reciprocal relationship, gathering knowledge from others while provide knowledge to others. Through simulations, we are able to model the social network of a knowledge community, within which players may experience, first hand, in a risk free environment, the process of knowledge exchange, which include how to going finding the right people with the right knowledge, how to get access to these people and how to in turn impart knowledge to others. Through this experience, we hope to trigger players’ reflections and insights of their own knowledge seeking and knowledge sharing processes such that the simulated experience itself might lead to actual change in player’s knowledge sharing behaviour.

2.2 Agent-based interventions

The level of the interactivity with the user can be radically transformed with the use of artificial agents which pro-actively manage the process of knowledge delivery, and more generally any knowledge-related processes. The birth of agent-based model as a model for social systems was put forward by computer scientist Craig Reynold, who tried to model the reality of lively biological agents, known also as artificial agents.

The idea is to construct the computational devices (known as agents) and then simulate them into a model of real phenomena. They have been used to explain the emergence of higher order patterns -- network structures of terrorist organizations and the Internet, power law distributions in the sizes of traffic jams, wars, and stock market crashes, and segregation despite populations of tolerant people. Agent based models also can be used to identify lever points, moments in time in which interventions have extreme consequences, and to distinguish among types of path dependency.

Three key concepts within agent-base models are: objects, emergence and complexity, with agent-based models consisting of dynamically interacting rule-based agents. It is in the interaction among these agents that result in interesting and complex situations, sometimes very much like those we see in real life.

Agents may be used to support “intelligently” the knowledge worker in the whole knowledge management cycle and in particular:
1. anticipate user’s needs
2. propose pro-actively knowledge objects to him/her that he/she would not be aware of
3. guide him/her, assess problems, suggest solutions, and advise him/her during his/her work process (decision making, problem solving, knowledge creation)
4. assist him/her in his/her interactions with others (active support for the social process)
5. stimulate and motivate him/her (integrate the human dimension)
6. help him/her to reflect, to restructure and to acquire new knowledge (help him to learn)

2.3 Social network analysis

Social network analysis (SNA) is a method for collecting, analyzing and presenting data about patterns of relationships among people and knowledge flows within a network. As a knowledge management practice, SNA has been used to study knowledge flows, the emergence of groups and the quality of their social relationships, as well as collaboration, innovation and knowledge diffusion.

Social network techniques have been around for some time. The idea of drawing a picture (called a “sociogram”) of who is connected to whom for a specific set of people is credited to Dr. J.L. Moreno (1934), an early social psychologist who envisioned mapping the entire population of New York City.

Cultural anthropologists independently invented the notion of social networks to provide a new way to think about social structure and the concepts of role and position (Nadel, 1957; Mitchell 1969), an approach that culminated in rigorous algebraic treatments of kinship systems (White, 1963; Boyd, 1969).

Today, the scholarly discipline is growing in the field of management as researchers have clearly demonstrated the extent to which informal networks pervade and affect life and work within organizations (e.g., Lincoln, 1982) A particularly important line of inquiry in this work has been to understand forces influencing the emergence of informal networks within organizations (Monge & Eisenberg, 1987; Monge & Contractor, 2000). Through such work we have learned that communication is likely to occur in homophilic relationships and have
evidence of the role of similarity between people in increasing the likelihood of communication (e.g., Zenger & Lawrence, 1989; Ibarra, 1992 & 1995; McPherson, et al 2001). At the same time we have also learned that design of an organization can have a strong influence on the pattern of informal networks via formal structure (e.g., Lincoln, 1982; Stevenson, 1990; Stevenson & Gilly, 1993; Brass, 1994), physical proximity (e.g., Allen, 1977; Monge, Rothman, et al, 1985) and nature of the task (Bavelas, 1950; Leavitt, 1951; Shaw, 1964).

The study of social networks has proceeded along four basically distinct, but interrelated, strands:

1. The statistical analysis of pathways through networks with varying degrees of local structure.
2. The qualitative description of the structure of networks in terms of local (e.g. clustering) and non-local (e.g., weak ties) features.
3. The renormalisation of networks, viewed as meta-networks of highly clustered or equivalent sub-networks.
4. The embedding of networks into (hopefully low dimensional) spaces where the coordinates are readily interpretable and relationships between members can be more easily visualised.

(1) (Wasserman, 2004)

Networks are frequently defined in the sociological literature on the basis of (at least) two relations: (1) how “far” each pair of vertices is from each other in the (unknown) metric of the (unknown) “social space”, and (2) whether or not they are connected and (perhaps) how strongly.

Professor Albert-Laszlo Barabasi, in his book "Linked: The New Science of Networks" clearly shows how the natural properties of networks are intrinsically part of everyday life and that the structure of networks is "the key to understanding the complex world around us." Every network (in whatever context) has been shown to have properties which follow mathematical rules. If we understand these properties we can exploit them in the way we design systems and processes. These properties include:
• Networks are simple
Any network consists of a set of nodes that are connected by links. Nodes may be land areas connected by bridges (the links), people nodes connected by handshakes, web pages connected by hyperlinks, etc…

• Networks are dynamic
Networks are dynamic, ever-changing entities. They grow and decay, attaching and losing nodes, seemingly at random.

• Networks consist of strong and weak ties
The strong ties are those between nodes that are closely related, and most tightly interlinked. The weak ties join those groups of nodes to other similarly tight clusters. Research has suggested that it is the weak ties that play a crucial role in spreading ideas to the outside world.


In terms of application, data from SNA may be leveraged to accelerate the flow of knowledge and information across functional and organizational boundaries; to identify the thought leaders, key information brokers and bottlenecks; and to identify opportunities for increasing impact by increasing flow.

Social network analysis provides a method with which to obtain a bird’s eye view of relationship, information and communication patterns and flows within a network of individuals. Applied to a community of users, such as the one TENCompetence aims to accomplish, SNA may be used to identify collaboration opportunities between individuals and among groups, to support critical junctures in networks that may cross functional, hierarchical and geographical boundaries, to make informal networks visible, such that individuals may systematically assess and support strategically-important collaboration, and to identify opportunities for intervention.

Furthermore, stimulus agents acting on SNA data may generate value interventions towards stimulating the participation of users. Such interventions include suggesting connections among users, setting up groups, closing the gaps in people’s knowledge of other members’ expertise and experience, and strengthening the cohesiveness within existing teams.
2.4 Social software

Social software are technological solutions to support the interactions among people. Broadly conceived, this term could encompass older media such as mailing lists and Usenet, but some would restrict its meaning to more recent software genres such as blogs and wikis. Others suggest that the term social software is best used not to refer to a single type of software, but rather to the use of two or more modes of computer-mediated communication that result in community formation. In this view, people form online communities by combining one-to-one (e.g., email and instant messaging), one-to-many (Web pages and blogs), and many-to-many (wikis) communication modes. In many online communities, real life meetings become part of the communication repertoire. The more specific term collaborative software applies to cooperative work systems.

Common to most definitions is the observation that some types of software seem to facilitate "bottom-up" community development, in which membership is voluntary, reputations are earned by winning the trust of other members, and the community's mission and governance are defined by the community's members themselves. Communities formed by "bottom-up" processes are contrasted to the less vibrant collectivities formed by "top-down" software, in which users' roles are determined by an external authority and circumscribed by rigidly conceived software mechanisms (such as access rights).

The term also arose in the late nineties to describe software emerging out of alliances between programmers and social groups whose particular kinds of cultural intelligence are locked out of mainstream software. In this understanding of the term, the social is understood to also have a political and aesthetic sense, not simply acting as a kind of glue for a collection of normatively understood 'agents' whose inter-relations are formatted by software. What both positions share is an understanding that particular design decisions and the grammar of interactions made possible by each piece of software is socially significant. As the term has become more important to the computer industry, this earlier use of the term has often been edited out of memory.

*Web 2.0, according to conference sponsor Tim O'Reilly, is an "architecture of participation"*- a constellation made up of links between web applications that rival desktop applications, the blog publishing revolution and self-service advertising. This architecture is based on social software where users generate content, rather than simply consume it, and on open programming interfaces that let developers add to a web service or get at data. It is an arena where the web rather than the desktop is the dominant platform, and organization appears
spontaneously through the actions of the group, for example, in the creation of folksonomies created through tagging.

The theory has been percolating for some time. O’Reilly published an essay on the topic, as well as a graphic outlining the key categories of this new medium (see figure 2).

Figure 2: O Reilly’s graphic map of Web 2.0

A blog is a web-based system where an individual can post text (and sometimes attachments, such as mp3 or image files) via a browser. Most blog systems allow some sort of categorizing or tagging of posts, and most publish an RSS feed (an XML file containing the blog post data) so that the posts can be distributed or syndicated to other websites and systems. Blog entries, also called "posts" or "stories," might be written by a blog owner, a contributing reader, or gleaned from other Internet resources. Blogs relies on the idea of using narratives (stories) to elicitate, capture and exchange personal knowledge.
3. Existing tools

3.1 Simulations
A recent IDC survey stated that "by 2008, the use of simulations will quadruple.... Simulations provide a parallel universe in which employees hone their skills... Innovative companies have realized this, and others will follow."

The power of a simulation is that it provides experience-based learning. It places the learner in a particular scenario and assigns the user a role and mission within that scenario. The user takes on the role and responsibilities within a virtual environment and through the game experience, gains valuable targeted skills.

3.1.1 EIS simulation http://www.calt.insead.edu/eis/
In the EIS Simulation, participants working in groups are challenged to introduce an innovation in a division of the EuroComm Corporation. They have up to 6 months of (simulated) time to convince as many of the 22 members of the division's management team as possible to adopt an important innovation, which in this case is an Executive Information System introduced corporate-wide to increase transparency and reporting. During the simulation, participants, operating as change agents, can choose among many different initiatives and change management tactics to meet their goal. They may gather information on the managers (the profiles, their relationships, etc.) or may take direct action to try to convince the managers and thus influence their willingness to adopt the proposed innovation. Each time participants implement a tactic, they immediately receive feedback about the impact of their decisions. The objective is to get as many adopters as possible, overcoming different forms of individual and organizational resistance to change.

The learning objectives: In today's complex business environment, organisations cannot avoid innovating, and implementing change has become one of the key tasks of managers. On the other hand- as everybody who has tried to introduce innovations and change in organisations knows by experience - managing change processes and making new things happen is often a difficult, lengthy and sometimes frustrating process. The EIS Simulation aims at providing managers with a shared experience. An experience which brings them in direct touch with a variety of factors impacting the dynamics of innovation and change in organizational contexts. It was developed and deployed successfully to provide learning experiences for decision makers interested in extending their change and innovation management competencies in specific contexts. It is addressing relevant competencies related to distributed
teamwork, collaboration dynamics and social networks. Finally it can help individuals and organisations to diagnose and learn to address cognitive and behavioural barriers.

3.1.2 BricksOrClicks  http://www.bricksorclicks.com/
BricksOrClicks.com is an exciting online simulation game. The player takes on the role of CEO of a traditional toy manufacturer called ToyBlocks Co., which must confront the challenges of deciding whether or not to launch an online sales channel while managing and maintaining its current traditional sales channels.

3.1.3 Food Force (http://www.food-force.com/fr/)
The United Nations Food Programme is using a game to raise awareness on major crisis situations. The mission of the game is to take part in a team in the island of Sheyilan and accelerate the World food Programme and help feed millions of people.

3.2 Social network analysis & visualization
In recent years important contributions have emerged from disciplines such as Social Network Analysis – SNA –providing new insights on how the social fabric within organizations and virtual communities develops and evolves. At the same time we have witnessed an explosion of tools and internet sites in the social networking area and the rise of the social dimension of internet usage, which has been often labelled as “Web 2.0”. Collaborative Environments are no longer a mere tool for facilitation but a locus of social practice.

3.2.1. Inflow  http://orgnet.com
Valdis Krebs, creator of Inflow, has used SNA towards identifying emergent communities of practices, collaboration, knowledge management, data mining, knowledge use and reuse, etc.

Inflow software and services have been used to map and measure networks, flows, and relationships in organizations, communities, and other complex human systems. It performs network analysis and network visualization in one integrated product. What is mapped in one window is measured in the other window, i.e. what one sees, is what one measures. It also provides easy access to the most popular network metrics and is compatible with Microsoft Office and the WWW. With visualization and metrics in one interactive interface, almost unlimited what-if scenarios are possible.

The TouchGraph browser allows one to examine the graph of similar items at one website. For example at the Amazon browser Items are linked together by directed edges, with an edge from item A to item B indicating that people who buy A also buy B.

3.2.3. **Jung** [http://jung.sourceforge.net/](http://jung.sourceforge.net/)

"Jung is composed of a software library that provides a common and extendible language for modeling, analysis, and visualization of data that can be represented as a graph or network. It is written in Java, which allows JUNG-based applications to make use of the extensive built-in capabilities of the Java API, as well as those of other existing third-party Java libraries. The current distribution of JUNG includes implementations of a number of algorithms from graph theory, data mining, and social network analysis, such as routines for clustering, decomposition, optimization, random graph generation, statistical analysis, and calculation of network distances, flows, and importance measures (centrality, PageRank, HITS, etc.)."

3.3 Social Bookmarking

Social bookmarking is server-side software aimed specifically at managing links with, crucially, a strong, social networking flavour, and an unabashedly open and unstructured approach to tagging, or user classification, of those links (Hammond et al, 2005).

It belongs to a new class of tools that caters more to the academic communities and that stores not only user-supplied tags, but also structured citation metadata terms wherever it is possible to glean this information from service providers. This provision of rich, structured metadata means that the user is provided with an accurate third-party identification of a document, which could be used to retrieve that document, but is also free to search on user-supplied terms so that documents of interest (or rather, references to documents) can be made discoverable and aggregated with other similar descriptions either recorded by the user or by other users.

Social bookmarking is currently used within firms. One of the primary benefits of an enterprise social bookmarking application is that it is an explicit assessment of the utility or value of various Internet and intranet information resources. As an information resource, there are many potential integration points with other corporate applications. Several of these are discussed here.
The first natural integration point would be to use the social bookmark link structure to augment enterprise search applications. Web resources with high bookmark counts are likely to be relevant and useful. Indices of role- or team-based bookmark collections can be specially weighted in role- and team-based search tools. An early variant of this search integration has already been developed as a Firefox plug-in. Intranet searches are augmented with a supplemental search of the bookmark collection, and bookmark matches are presented, as a group, in the search results list.

A second integration would be to combine an individual’s bookmarks with other information sources provided by that individual. A research prototype of an enhanced corporate directory service has already embedded portions of an individual’s bookmark collection in directory information. The idea is that an individual’s bookmark collection is a meaningful reflection of the topics of general interest to that individual. This may be a powerful mechanism to provide dynamic updates to the “current interests” profiles for individuals. In a similar manner, corporate bloggers have embedded recent personal bookmark collections in their home blog pages.

A third natural integration point would be to place bookmark collections from a group of individuals into Web sites maintained for various teams or projects. We have already observed one team, which is focused on e-learning, embed a collection of bookmarks on a team Web site. Again, using the subscription services supported by the bookmarking application allows automatic updating of bookmarks, promoting timely sharing of important information among team members.

3.3.1 Del.ici.ous http://del.icio.us/

Delicious has received a great deal of attention of late, have pioneered a concept that some people call "folksonomy" (in contrast to taxonomy), a style of collaborative categorization of sites using freely chosen keywords, often referred to as tags. Tagging allows for the kind of multiple, overlapping associations that the brain itself uses, rather than rigid categories.
3.3.2 Connotea

Connotea was developed as an experimental service by NPG's New Technology department, with Ben Lund as project lead, and seeks to provide the best of both worlds.

Connotea is also equipped to function as a citation manager and currently supports retrieval of metadata elements from a number of sites including PubMed, HubMed, Amazon.com, Nature.com, and D-Lib Magazine. Further development in this area is planned. A companion paper reports in detail on Connotea as a case study in implementing a social bookmarking tool.

Key features include:

- **Online storage of references and bookmarks**
  The current standard practice in personal reference management is to have a database of citations stored locally on a user's own computer, and manipulated using dedicated desktop software. Moving the database online has a number of advantages: it makes the collection available from any web-enabled computer, and it allows easy sharing of personal collections. Of course, online storage has its disadvantages too: the responsiveness and usability of the application, for example, and the fact that the availability of your data is in the hands of others.

- **Simple, non-hierarchical organising**
  Instead of placing reference material in folders, or folders within folders, the organisational apparatus of Connotea creates a totally flat, but multi-faceted, space. The data can be viewed from the perspective of tags, or users, or links. The 'tags' of Connotea and other social bookmarking tools often lead commentators to decry the anarchy of unconstrained keywords, but this overlooks the fact that tags are intended first and foremost as a way for individual users to manage their own collections. In this way, they are similar in purpose to folder names in computer file systems. However, instead of creating sub-levels of organisation by nesting folders hierarchically, flat tagging achieves this by assigning multiple tags to each item, each tag being treated equally. This releases the user from some of the constraints of a traditional file system, and a web-based interface allows easy navigation of material organised in this way.

- **Opening the list to others**
  All bookmarks posted to Connotea are visible to all registered users and visitors. This takes the concept of sharing to a new level, but also brings new opportunities. The main benefits of openness come not just from the ease with
which it allows explicit sharing with friends and colleagues, but from many users storing their bookmarks in the same place. This allows Connotea to automatically discover and present connections between users. For example, if someone else has bookmarked the same things as you, that person’s library will be a good candidate for a place to find interesting new content. In addition, shared lists allow more sophisticated collaborative filtering algorithms to make recommendations of the form "people who bookmarked this also bookmarked…".

- **Tagging**
  Tags are the means by which references are organised in Connotea. Suitable tags should therefore be meaningful in the context of a particular article and a user. For this reason, Connotea allows tags to be almost anything (including both single words and phrases). As discussed above, tags can be thought of as a list of categories for the article, or as folder names, albeit without the potential inconvenience of hierarchy and with the bonus of being able to store the article simultaneously in multiple folders.

- **Comments**
  The other noteworthy piece of personal data is the user’s comment. Each user can comment any number of times on any bookmark in their library, and comments from different users are combined to display a chronological, and conversational, thread about a resource. The idea is that when a user is viewing an article that they already have in their Connotea library, they can quickly and easily add a public note about it.

- **RSS**
  The bookmarks stored in Connotea can be viewed and navigated by user, by tag or by a combination of users and tags. This means that if, for example, you find the collection of a particular user interesting, you can be alerted via RSS to any items that are added.
3.4 Social Tagging

Collaborative tagging describes the process by which many users add metadata in the form of keywords to shared content. Recently, collaborative tagging has grown in popularity on the web, on sites that allow users to tag bookmarks, photographs and other content. Content and commerce domains have already begun to open their information architectures to empower their consumers to tag and create greater degrees of faceted, semantic relationships between their information objects. Folksonomies change the dynamics of generating useful index pages, eliminating the need to manage the creation of value and increasing the potential clickthroughs necessary for a particular content. The usefulness of these visible, semantic relationships to the person searching for specific content or product, is quite possibly the most "sticky" form of extended discovery. The tagging simultaneously allows me to peer into the world of like-minded folk (ergo: folksonomies). Tagging creates community and increase the findability of content and products.

3.4.1 43 things www.43things.com

43 Things or 43things.com is a social networking site that is built on the principles of tagging. Users create accounts and then list a number of goals or hopes; these goals are parsed by a lexer and connected to other people’s goals that are constructed with similar words or ideas. This concept is also known as folksonomy. What makes the site work is how it connects the people to each other. For example, you state a goal, such as "write a novel." That immediately links you to all the other people who have the exact same goal. But you also attach tags to your goal -- essentially key words that you choose -- such as "writing," "novel" and "fiction." Tags are not selected from any pre-codified hierarchy set by the site designers. They simply arise from the grass roots -- you and others like you. Then you're suddenly connected to everyone with similar goals, such as "write a good novel" and "write a book and have it published" and "finish my novel." On social networking sites like Orkut or Friendster, people join, and then declare their alliances to each other explicitly. On sites that employ tagging, the networks emerge, implicitly, out of the shared interests of users. Order isn't proclaimed, it just happens.
4. Designing for TENCompetence

Based on the review and the current tools on SNA, we are now exploring ways to extend existing tools such as using algorithms to generate meaningful visualizations, as well as visualizations that can change dynamically according to new input (as opposed to bestiario, which maps an unchanging network)- for example, if we enter new information into my profile, it will be reflected automatically in the map. This will allow users instantaneous, real-time info on the network.

We must consider as well that Friendster and Ryze are not as popular as they used to be. The “trendy” social networking sites are now “Facebook” and Myspace”. Back in 2003, MySpace’s social-network ancestor, Friendster, was huge. Founder Jonathan Abrams had created an online nexus intended specifically to establish and explore degrees of separation. But users started to create faux profiles, or Fakesters, satirizing everything and Abrams demanded that they be removed. By November 2003, Wired published a story about the "Friendster abandonment trend."
3.2 Designing Socially-enhanced Virtual Community Environments in a Competence Development Context

1. General Design Considerations

Based on the research conducted in previous phases of the project, the process of designing interactive systems to support people to access, gradually develop a good understanding, and ultimately select the most appropriate Competence Development Opportunities (CDO) requires to take explicitly into consideration the social context and dynamics in which such processes take place [see State of the art reports for 8.2 and 8.31].

Therefore, such an interactive system can be best conceptualized and designed as a Virtual Community Environments with a number of Specific Features and Embedded Dynamics, all oriented towards helping users to:

- gain an overview of and become aware of relevant Competence Development Opportunities (CDO),
- build an informed opinion about which ones would best fit their objectives and aspirations, and
- get the possibility to share their experiences and engage in productive knowledge exchanges with other users.

This document aims at describing how such an interactive system can be implemented, focusing specifically on the design of its:

- CDO Overview Dimension (see section 2)
- People and Virtual Community Dimension (section 3)
- Embedded Stimulus Agents and Game Dynamics (section 4)

In section 5 we include a number of considerations related to the use of “Connectedness” as a way of measuring Value Creation within such an interactive environment, as well as issues
related to the sustainability (governance, growth) of this type of Virtual Community Environments.

2. Design of the CDO Overview Dimension

2.1 Designing the Overview Tool

A first important objective is to provide users with a good overview of available CDOs. This can be achieved by supporting the users in navigating through a Structured Space in which different type of CDOs are grouped in categories.
As displayed in the Figure above², CDOs can be first grouped in 4 Main types as a function of the **Type of Experience** they propose to the users. In fact, such an experience consists mainly in interacting with either “**Things**” (i.e. more of less interactive artifacts or "knowledge containers" such as books or software) or “**People**” (like experts, peers, or friends) in different types of "knowledge exchange contexts" (like an online workshop, a traditional course, or a one-to-one meeting or exchange). The "**social**" component of the experience will be **low** or **high** accordingly.

In the first 2 of the **Main Types** we have Competence Development Opportunities facilitated by **non-interactive material** such as Books, Videos, etc. or by **interactive material** such as OnlineTutorials, Single-User Games, etc.

In the third Main Type we have Competence Development Opportunities facilitated by interacting within specific **knowledge exchange contexts** (a Course, a Community, etc.) with a group of other people, such as participating in a Workshop, in Multi-Users Games, etc.

In the fourth Main Type we have finally Competence Development Opportunities enabled by **interacting directly with people** such as experts, peers, teachers, but also family members, friends, etc.

² A partial, but interactive version of this early prototype can be accessed at [http://www.calt.insead.edu/eis/cdm/1.htm](http://www.calt.insead.edu/eis/cdm/1.htm) - in this prototype, the subcategories are implemented through a simple Wiki structure, which will not be suitable for the actual system.
As displayed in the Figure below, each Main Type can have a number of Subtypes, corresponding to traditional ways of classifying CDOs.

For each Main Type of Competence Development Opportunities (CDOs), the user should be able to display the corresponding CDOs in different ways, to facilitate navigation through:

- **Linear browsing** - as displayed above.
- **Resources Maps** - visualization of networks linking different CDOs (CDO-CDO Relationship Networks) according to different criteria - similarity, types, related competences, etc. – see section 2.2.
- **Connection Maps** - visualization of networks linking CDOs to People (CDO-People Relationship Networks) according to different criteria – awareness, knowledge, interest, etc. – see section 3), and
- **People Maps** - visualization of networks linking People to People (People-People Relationship Networks) according to different criteria – groups, knowledge, interest, etc. – see section 3.

Visualization and Navigation Options

Once a Subtype is selected, the corresponding CDOs are displayed (according to the selected Visualization and Navigation Option. At this point, users can:

- select each CDO to access specific information (included in the CDO Profile - section 2.2).
- select each CDO to participate into CDO-related activities (such as rating it or participating in a knowledge exchange about experiences with this CDO – see section 2.2)
• select each CDO to edit/modify its related information (reflected in the CDO Profile - section 2.2)
• introduce new CDOs fitting in the selected Subtype
• remove/archive (with the appropriated access right) the CDO
2.2 Profiling Competence Development Opportunities

Each CDO has a Profile which users can visualize to gather more information or to engage into activities/exchanges related to the specific CDO (such as rating and commenting/discussing).

A CDO Profile includes at least the following items:

<table>
<thead>
<tr>
<th>Basic Information Fields</th>
<th>These are fields such as Name, Location, Description, Specific Type, Links, Competences Addressed, Date Inserted, and Last Date Modified.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDO-CDO Relationships Fields</td>
<td>These are fields providing information about how the CDO connects to other CDOs, such as is_related_to, and is_required_for.</td>
</tr>
<tr>
<td>CDO-People Relationships Fields</td>
<td>These are fields providing information about how the CDO connects to specific People, such as inserted_by, managed_by, accessed_by, known_by, and is_involving – meaning the set of people involved in actually delivering the specific CDO.</td>
</tr>
</tbody>
</table>

In more details for a CDO please find all the necessary fields on the next table.
<table>
<thead>
<tr>
<th>Field/Slot Name</th>
<th>Type of Values</th>
<th>Default Value</th>
<th>Manual/Automatic</th>
<th>Reason/Meaning/Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDO ID</td>
<td>An integer</td>
<td>N/A</td>
<td>A</td>
<td>Identification of CDO with a UNIQUE ID</td>
</tr>
<tr>
<td>Location</td>
<td>A unique path</td>
<td>http://...</td>
<td>M</td>
<td>Location path of the CDO</td>
</tr>
<tr>
<td>Type</td>
<td>List of 4 main Types</td>
<td>N/A</td>
<td>M</td>
<td>Classification of CDOs in 4 main Types</td>
</tr>
<tr>
<td>Subtype</td>
<td>List of 21 Subtypes or Insert new</td>
<td>N/A</td>
<td>M</td>
<td>Classification of CDOs in 21 or more subtypes</td>
</tr>
<tr>
<td>Description</td>
<td>Html text</td>
<td>None</td>
<td>M</td>
<td>A small textual description of a CDO that can include relevant information and links</td>
</tr>
<tr>
<td>Author</td>
<td>Creator of the CDO</td>
<td>None</td>
<td>M</td>
<td>Authorship of a CDO</td>
</tr>
<tr>
<td>Last modification Author</td>
<td>Member id, Name</td>
<td>None</td>
<td>M</td>
<td>Track the latest updates of a CDO by the Member id</td>
</tr>
<tr>
<td>Date inserted</td>
<td>Date</td>
<td>N/A</td>
<td>A</td>
<td>Creation Date of a CDO</td>
</tr>
<tr>
<td>Last modification date</td>
<td>Date</td>
<td>N/A</td>
<td>A</td>
<td>Last Update of a CDO</td>
</tr>
<tr>
<td>Key Competences Addressed</td>
<td>List of Competences or Insert New</td>
<td>None</td>
<td>M</td>
<td>Member specifies the name of three competences or can insert a new one. Important for agents support, for matching (connectedness) and filtering (navigation options)</td>
</tr>
<tr>
<td>Competences Needed</td>
<td>List of Competences or Insert New</td>
<td>None</td>
<td>M</td>
<td>List of competences needed to complete the CDO as defined by the CDO Author</td>
</tr>
<tr>
<td>Time</td>
<td>Time in a scale of 1-5</td>
<td>1 Day</td>
<td>M</td>
<td>Textual indication of Necessary time of investment as estimated by the CDO Author</td>
</tr>
</tbody>
</table>

**Opmerking [MSOffice1]:** For introducing a new competence a user needs to specify a unique name and the tool provides a textual description introduced.

**Opmerking [MSOffice2]:** For very short, short, long, very long, don't know or introducing a new competence a user needs to specify a unique name and the tool provides a textual description introduced.
<table>
<thead>
<tr>
<th>Field/Slot Name</th>
<th>Type of Values</th>
<th>Default Value</th>
<th>Manual/Automatic</th>
<th>Reason/ Meaning/ Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td>Choice in pre-selection (tick box)</td>
<td>English</td>
<td>M</td>
<td>Classification of CDOs according to Language</td>
</tr>
<tr>
<td>License</td>
<td>Free, Opensource, Proprietary</td>
<td>Open Source</td>
<td>M</td>
<td>Classification of CDOs according License</td>
</tr>
<tr>
<td>Linked CDOs</td>
<td>List of CDO ids</td>
<td>None</td>
<td>M</td>
<td>List of connected CDOs according to similarities</td>
</tr>
<tr>
<td>Attachments</td>
<td>List of files and/or urls</td>
<td>None</td>
<td>M</td>
<td>CDOs’ further details other than a given url</td>
</tr>
<tr>
<td>Visits</td>
<td>List of Member ids, Dates</td>
<td>N/A</td>
<td>A</td>
<td>Log in history of a CDO</td>
</tr>
</tbody>
</table>

In more details for a CDO-CDO relationship:

<table>
<thead>
<tr>
<th>Field/Slot Name</th>
<th>Type of Values</th>
<th>Default Value</th>
<th>Manual/Automatic</th>
<th>Reason/ Meaning/ Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is Related to</td>
<td>List of CDOs + a value to describe the intensity</td>
<td>None</td>
<td>M</td>
<td>Indication of relationships and their intensity among CDOs</td>
</tr>
<tr>
<td>Is Required for</td>
<td>List of CDOs and/or list of Competences Needed</td>
<td>None</td>
<td>M</td>
<td>List of CDOs needed to complete a given CDO as defined by the CDO Author</td>
</tr>
<tr>
<td>Has similar Location</td>
<td>List of CDOs</td>
<td>N/A</td>
<td>A</td>
<td>List of CDOs within the same Location</td>
</tr>
<tr>
<td>Has similar Language</td>
<td>List of CDOs</td>
<td>N/A</td>
<td>A</td>
<td>List of CDOs offered in the same Language</td>
</tr>
<tr>
<td>Needs same Time of investment</td>
<td>Time</td>
<td>N/A</td>
<td>A</td>
<td>Textual indication of necessary time that CDO Author will describe from a choice between very short, short, long, very long, don’t know</td>
</tr>
<tr>
<td>Has same Competences Addressed</td>
<td>List of CDOs</td>
<td>N/A</td>
<td>A</td>
<td>List of CDOs with the same Competences Addressed</td>
</tr>
</tbody>
</table>
In more details for a CDO-People Relationship:

<table>
<thead>
<tr>
<th>Field/Slot Name</th>
<th>Type of Values</th>
<th>Default Value</th>
<th>Manual/Automatic</th>
<th>Reason/meaning/usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is Managed by</td>
<td>A Member id, a Group or Everybody</td>
<td>Author id</td>
<td>M</td>
<td>Identification of Members that have been “connected” with the CDO</td>
</tr>
<tr>
<td>Last Accessed by</td>
<td>Member ids</td>
<td>N/A</td>
<td>A</td>
<td>Identification of latest updates by the Member id that last updated a CDO</td>
</tr>
<tr>
<td>Has been Visited by</td>
<td>List of Member ids, Dates</td>
<td>N/A</td>
<td>A</td>
<td>Identification of who and when has accessed the CDO</td>
</tr>
<tr>
<td>Is Inserted by</td>
<td>Member ids, Name</td>
<td>N/A</td>
<td>A</td>
<td>Authorship of a CDO</td>
</tr>
</tbody>
</table>
**Associated Forum/Blog**

These are simple interaction spaces users can exploit to engage into knowledge exchanges related to the CDO:

- A **Forum** environment should be available to enable users to see ongoing discussion threats, participate in them, or initiate new ones.
- A **Blog**-like structure should be available to record chronological events related to this CDO (its “history”).
- A **Tag** mechanism will be used to classify content by means of a folksonomy. The system will provide links to other items that share the same tag. This allows “multiple browseable” paths.

**Special Information Fields**

These are special fields supporting Rating, Assessment, and Opinion Aggregation mechanisms, if included.

---

### 2.3 Visual Representations and Networks Navigation Features

Within this context there are a number of relevant “Connections” (among CDOs, among CDO Categories, among People, among People Groups, or between CDOs and People) which need to be visualized.

It is therefore key for the system to provide mechanisms to visualize Relationship Networks, whose Nodes are CDOs, CDO Types, People, or People Groups, and whole links are the different relationships defined between these Nodes. Such visualizations need to be “interactive” in terms of supporting users to use them for Navigating in dense Networks, enabling them to:

- focus/zoom into a specific Node (focusing) or subset of the Network (zooming)
- to decide the visibility/overlay of different Nodes Sets and Relationship Networks

Ideally, users should also be able to perform basic “manipulations” on such network visualizations to modify the location/visual positioning of Nodes or set of Nodes.

Ultimately, such interactive visualizations should become not only “clickable”, but totally “editable”.

TENCompetence – IST-2005-027087
3. Design of the People and VC Dimension

3.1 Designing the People/Community Overview Tool

From the main screen, users should not only get access to an overview of CDOs, but also be able to get an overview of other users/community members. To make the system “socially translucent”, a number of minimal features should be included in the system:
A user when logged in will be able to have an overview of the following “spaces”:

<table>
<thead>
<tr>
<th>Field/Slot Name</th>
<th>Type of Values</th>
<th>Reason/Meaning/Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Me (my Profile)</td>
<td>All the fields included in the Member ID Profile</td>
<td>Overall view of all my personal information</td>
</tr>
<tr>
<td>My Objectives</td>
<td>List of Competences Desired+ Link to blog</td>
<td>Important section for the agents for “matching” members with similar Desired Competences</td>
</tr>
<tr>
<td>My Network</td>
<td>List of linked CDOs, List of Buddies</td>
<td>Have an overall view of all my connections</td>
</tr>
<tr>
<td>Search and Connect</td>
<td>Displays the Search Interface in which a Member can combine different filters to browse the network</td>
<td>Connections and relationships with CDOs and Members. Navigation options and filtering by relationship, CDO type, Date, Rating, Member.</td>
</tr>
<tr>
<td>Online Members</td>
<td>List of Member IDs (currently logged in)</td>
<td>Tracking who is online and possibility to contact her by using a forum, IM or skype</td>
</tr>
<tr>
<td>Log In History</td>
<td>List of visited CDOs, User IDs, forums...(Events)</td>
<td>Last events of a Member</td>
</tr>
<tr>
<td>Most Popular</td>
<td>Display List of User IDs and CDOs</td>
<td>Overview of the most active Members and most popular CDOs</td>
</tr>
</tbody>
</table>
### 3.2 Profiling Users

Community Members, like CDO, need to have a Profile, editable by the corresponding user and visible (although eventually only partially) to other members.

A Member Profile includes at least the following items:

<table>
<thead>
<tr>
<th><strong>Basic Information Fields</strong></th>
<th>These are fields such as Name(s), Location, Description, Profession(s), Organization(s), Specific Type/Group(s), Links, Competence Levels, Date Inserted, and Last Date Modified.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>People-People Relationships Fields</strong></td>
<td>These are fields providing information about how the Member connects to other People (who could be Members or not), such as is_similar_to, appreciates, and knows.</td>
</tr>
<tr>
<td><strong>CDO-People Relationships Fields</strong></td>
<td>These are fields providing information about how the Member connects to specific CDOs, such as the equivalent of those mentioned in section 2.2 (inserted_by, managed_by, accessed_by, known_by, and is_involving – meaning that the Member is involved – e.g. as an instructor – into the delivery of a given CDO).</td>
</tr>
<tr>
<td>Field/Slot Name</td>
<td>Type of Values</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Member ID</td>
<td>An integer</td>
</tr>
<tr>
<td>Alias</td>
<td>Text</td>
</tr>
<tr>
<td>Description</td>
<td>Html text</td>
</tr>
<tr>
<td>Competences</td>
<td>List of Competences or Add new.</td>
</tr>
<tr>
<td>Desired Competences</td>
<td>List of Competences or Add new.</td>
</tr>
<tr>
<td>Interests</td>
<td>List of Interests or Add new.</td>
</tr>
<tr>
<td>Coordinates</td>
<td>Email, phone, personal url, skype ID, msn account</td>
</tr>
<tr>
<td>Geo-location</td>
<td>Address</td>
</tr>
<tr>
<td>Language</td>
<td>List of Languages</td>
</tr>
<tr>
<td>Buddies</td>
<td>List of Member ids</td>
</tr>
<tr>
<td>Blocked Members</td>
<td>List of Member ids</td>
</tr>
<tr>
<td>Date of Membership</td>
<td>Date</td>
</tr>
<tr>
<td>Recent Activities</td>
<td>List of Events</td>
</tr>
<tr>
<td>Log in history</td>
<td>Last week, Last month</td>
</tr>
</tbody>
</table>
In more details for a People-People Relationship:

<table>
<thead>
<tr>
<th>Field/Slot Name</th>
<th>Type of Values</th>
<th>Default Value</th>
<th>Manual/Automatic</th>
<th>Reason/ Meaning/Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is Similar to</td>
<td>List of Member Ids</td>
<td>N/A</td>
<td>A</td>
<td>Possibility to filter search by Geo-location, Language, Competences, Desired Competences, Interests, and Buddies.</td>
</tr>
<tr>
<td>Knows of</td>
<td>List of CDOs and Member IDs</td>
<td>N/A</td>
<td>M</td>
<td>Display an overall view of CDOs or Member Ids that I Had an Interaction with</td>
</tr>
<tr>
<td>Likes</td>
<td>List of CDOs, List of Buddies</td>
<td>N/A</td>
<td>M</td>
<td>Matching Members according my preferences.</td>
</tr>
</tbody>
</table>
3.3 Relationship Networks

The same mechanisms and functionalities described in section 2.3 should also be used to visualize and navigate through People-People Relationship Networks, i.e. emphasizing relationships such as “is_similar_to”, “appreciates” or “knows”.

Such visualizations should be based on relationships which are stored explicitly in the Profiles, as well as on relationships which can be inferred automatically by the system (by an Agent – see section 4) through the dynamic computation of relationship values (such as “could_benefit”, meaning that a Member m1 could benefit from interacting with another Member m2).
4. Design of Embedded Dynamics: Stimulus Agents and Game Dynamics

4.1 On the Role of Embedded Dynamics

Within the described system, a number of embedded dynamics are implemented in forms of either Stimulus Agents (Suggestions provided dynamically to a User during a Session) or Game-like Dynamics the user is invited to join (both single-user and team dynamics), or both. The design of a number of such dynamics is described in detail in sections 4.2 “Connection Agents” and 4.3 “Connection Games”.

As their names indicate, these embedded dynamics have one particular aim and function to add value to the user by helping her establishing new “Connections” or strengthen existing ones – in any case to make the user more “connected” in an efficient (and enjoyable) way – see also section 5.

We have identified 4 distinct domains in which such embedded dynamics can contribute in increasing the users’ “connectedness” in a significant way. Their primary purpose is to support the emergence or strengthening of connections between a user and:

1. Herself
2. The Community
3. CDOs
4. The System she’s using
In these 4 different ways, value can be created for and by the user in a number of critical domains, supporting and stimulating her to:

- discover
- learn about and from
- engage into and with
- share related knowledge and insights
- act upon

the opportunities emerging from the connection created (or strengthen). A corresponding Table is included below.

<table>
<thead>
<tr>
<th>Connection Type/Target</th>
<th>Value creation Dimensions addressed (Stimulus Domains)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Self</td>
<td>• Own CDOs experiences</td>
</tr>
<tr>
<td></td>
<td>• Personal CD Objectives</td>
</tr>
<tr>
<td>2. Community</td>
<td>• Relevant Others and Groups (People Matching and Recommendation)</td>
</tr>
<tr>
<td>3. CDOs</td>
<td>Relevant CDOs and CDO Categories (CDOs Matching and Recommendation Dynamics)</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>4. System</td>
<td>Own competence in generating and extracting value from system usage and active involvement</td>
</tr>
</tbody>
</table>

In other words, perhaps (and add the Community one):

![Diagram](image-url)
4.2 “Connection” Agents: Types of Stimulus Agents

Detailed descriptions of the specific purpose and interaction with:

1. Your Personal Coach Stimulus Agent
2. Your Community Connection Stimulus Agent
3. Your CDOs Connection Stimulus Agent, and
4. Your Member Productivity Stimulus Agent.

We now turn to the description of the two agents that will assist users in their profile creation and network usage tasks.

4.2.1 The ‘Personal Coach’ agent

This welcome agent is responsible for introducing you to the network of Competence Development Opportunities. Its basic function is to create your TenCompetence, via which you will be seen. The more precise and correct the information extracted and recorded about the user is, the more relevant its feedback (and the other agents’) will be.

4.2.2 The ‘Concierge’ agent
This agent intervenes at a later stage. It will be the agent that the user will interact with each and every time she connects. It will also be responsible for connecting with the community, with CDOs and for member productivity improvement.

4.2.3 The CDO Connection Agent

This agent will create links between CDOs and will suggest relevant CDOs and people based on Member provided key words.

4.2.4 The Member Productivity Agent

This agent will be parameterized to suggest members to go back to past Events and reflect on them.
4.3 **Network navigation functionalities:**

The network will provide facilities to display CDOs and their interconnections, and to identify and access potentially relevant CDOs.

4.3.1 **Display options**

Zooming facilities will be provided to enable both the visualization of a large number of objects on the screen, their relative importance and usage and their interconnections (macro-level), and the visualization of all the connections for, say, a single CDO (micro-level) [Tufte]. A "100%" button will restore the original view.

Users will also get the possibility to center the map on a particular CDO node. The network representation should adapt itself around this node. This implies that facilities to reorganize the nodes on the screen - according to particular predefined layouts such as pyramids or a flat list - shall also be offered. These functionalities will facilitate the appropriation of the network by the user, by granting her the chance to visualize data in multiple ways.

A "home" button will restore a pristine view of the work, while "undo" and "redo" buttons will give a chance to experiment with visualization options without worrying about consequences.

4.3.2 **Filtering options**
A filter box will enable users to remove unwanted information from the network representation. A separate window will allow them to combine:

- **Expression-based filters**: she will be able to focus on the nodes matching a particular text expression (include regular expressions too). It could be nice to leverage the information of the network to propose, in answer to a filter, the CDO descriptions being the closest syntactically to the one inputted.

- **Type-based filters**: this filter will hide all the nodes in the network not matching the type chosen by the user. A filter on the “Type of Experience” is going to be especially useful for users who are only interested in interacting with people.

- **A 'people' filter**: will be used to display highly connected people (e.g., the hubs in a network). It will also display people who should spend some time adding links

- **A 'relations' filter**: will display only the relations (between CDOs and/or people) selected by the user

- **Rating-based filters**: this filter will only display the materials having been rated higher than a user-defined threshold.

- **Novelty-based filters**: this filter will only display material that has been recently used, updated or rated.

### 4.3.3 Navigation design diagram
The following figure organizes user actions according to the screen they will belong to.
4.4 “Connection” Games: Types of Game-like Social Dynamics

Detailed descriptions of the specific purpose and interaction with:

1. **Personal Development** Connection Games
2. **Community** Connection Games
3. **CDOs** Connection Games, and
4. **Member Productivity** Connection Games.

4.5 Events

In this section will describe the events that occur in the system. Introduction of the notion of action parameters, to regroup conceptually-related user actions.

4.6 Navigation Diagram

The goal of the diagram is to organise the different actions undertaken by the user in terms of the user interface (or window, frame,...) they belong to

- Actions are organised according to the classification given at the beginning of the design document
- Interactions between interfaces are also mentioned
- Entry point is the "Welcome interface"
4.7 Activity Diagrams

In this section we describe the events that occur during different stages of members interactions. The goal is to give a dynamic view of the prototype (e.g. what happens when this happens, what follows this action?)
5. Considerations about Value Creation, Measurement, and Sustainability

Based on the research conducted in previous phases of the project, the process of **Specific Features** and **Embedded Dynamics** to be implemented to emphasize the networking, knowledge exchange and knowledge transfer dynamics

5.1 Using “Connectedness” as a Value Creation Metric
6. Remarks, Next Steps and Integration Issues

Issues to include in the research agenda and will be addressed at a later stage:

- The importance of roles and seniority in a community of practice context.
- Access rights and authorship. (In which fields only an author of a CDO can intervene and how members can suggest changes?)
- Groups (We are going to extend that to the existing system by introducing the importance and role of groups and group formation.)
- Special information fields we are considering like ratings, qualitative assessment and a number of opinion aggregation mechanisms. Insights from the literature will help us validate the value created for community building.
7. Prototype Testing Scenarios

The following scenario illustrates the interactions between a new user and the "Welcome agent".

7.1 Initiation Process Scenario

There has been a lot of buzz about this 'competence development framework' in the news lately, and I am keen to give it a try and check whether it could be help me. I have a deadline looming and I need to get in touch with relevant information and people.

After having chosen a member name and a password, I am greeted by a "Welcome agent", whose role is, in its own words, "(i) to make me aware of my environment by making me formalise my expectations, competence development objectives and interests, and (ii) by introducing me to relevant competence development opportunities, such as books or experts."

First-time login

- Contact details
The welcome agent guides me through a form in which I have to mention my name, email address and further contact information. It also recommends me to attach a photograph to help everybody remember me.

- Competences

The agent informs me that we are going to focus on my current competences, objectives and (optionally) on additional interests.

A five-row table is proposed to list my current competences. Each row, or slot, is composed of a free-text zone and what seems to be a rating zone. The first competence I want to mention is "Development of Web sites". The system dynamically updates a selection of existing competences matching the letters I have already typed, and displays them in a drop-down menu. I find a competence "Development of data-driven dynamic Web sites" that I decide to use by clicking on it. It is actually a more precise description than the one I had originally in mind, which I find interesting. I select a "high" level of expertise for that competence by clicking on the corresponding checkbox.

I follow the same process to add two more competences, "PHP" and "Prototyping in Python", for which I select, respectively, "high" and "average" as the associated level of expertise. The agent suggested "Python" from the list of existing competences for the latter, but I decided to stick to my own description, as it was much more precise and I am not willing to hear from anybody who knows about Python.

(Should I find nobody interesting later on, I will probably remove unnecessary detail from my competence descriptions.)
Right after clicking on "Validate", a new agent comes into play, the "concierge agent". It informs me that it has identified a set of members and CDOs matching each of my current competences, and that it will display that list at the end of my registration process.

- Objectives and interests

I follow a similar process with my objectives and my interests. For each of them, the agent has been able to identify relevant members and CDOs.

- Completing the registration

My registration is now complete. The welcome agent displays a "What next?" window that contains lists of members and CDOs that may be of interest to me. I access the profile of the first person and I realise that this could be someone to get in touch to. I decide to add her to my buddies list by clicking on the 'buddy' icon next to his name.

Important note:

This scenario assumes that several members registered previously, and that one of them has entered a competence that is matched by the agent. Should this not be the case (if our user is one of the very first members), the user will not be proposed suggestions. It should not prevent her from completing this process though.
Successive logins

I do not interact with the "welcome agent" anymore. It is now the "concierge agent" who greets me every morning, and who brings me the latest news about the network. In particular, it lets me know about people who have just joined and whom may be relevant to approach, the most successful CDOs over the last week, or even replies to the comments I have made about the CDO I took last week.

The "concierge agent" can also help me identify additional CDOs, by sending my expectations to a "CDO connection agent" or to my "personal coach agent", both having for mission to guide me towards the right resources to fulfil my objectives.
### 7.2 Competence Development Scenario

I, as a Member, need to extend my competences in a given domain: “Notes and SameTime Software Development” (NSTSD).

The overall objective of the system is to “connect” me properly to relevant CDOs, emphasizing the People and Social Network dimension. The following scenario describes how the system can help users to identify:

(1) People who “know about” CDOs related to NSTSD (i.e people who authored them, or actively contributed to them (by posting contributions in the Forum/Blog/Tag section), or simply visited such CDOs).

**Network Navigation Approach:**

(N1) I first identify relevant CDOs by selecting one of the first 3 types, or directly one of the SubTypes, and visualize all the CDOs, then use the option “Focus On subject”, indicating as an entry: “NSTSD” (e.g. all the CDOs in which NSTSD is mentioned somewhere in the CDO Profile – in the field “Related Competences” or in the Forum, etc.)

(N2) I extend the result by selecting the option “Display Also”, indicating the entry “Related People” which will add to the display all the People who have Connections/Relationships (any) with the displayed CDOs.

(N3) I narrow down the search by selecting the option “Display Only”, indicating the entry “Author of” as the only Relationship to be displayed.
Or (faster)

(N1bis) I select directly the 4th Type of CDOs (People as CDOs), and visualize all the CDOs, then use the option “Focus On subject”, indicating NSTSD (e.g. all the CDOs in which NSTSD is mentioned somewhere in the CDO Profile – see above – as well as somewhere in the Profile components of the Member, in case the Person is also a Member – there might be People who are included as CDOs but are not Members).

(2bis) I continue like in (N3) above.

Agent-based Approach

(A1) A “CDO Connection” Agent will be activated (or I activate it by providing him the keyword “NSTSD”) and suggests me (there is a window in which agents “communicate suggestions to me”) to have a look at relevant CDOs and People. If I accept, the Agent identifies all the related CDOs of any of the 4 types (in either List or Network format). The result includes automatically all the People and CDO that user could identify manually after reaching point 1’.

The Agent automatically calculates an “internal relevance measure” for each CDO (and People) identified and adapts accordingly the List and the Network visualization to facilitate/speed up further exploration.

(A2) The “CDO Connection Agent” might make a suggestion now such as “Try to narrow down your search by using the “Display Only” option”.

Game-based Approach

(G1) The “Personal Coach” Agent will be activated (or I activate it by providing him the keyword “NSTSD”) and suggests me the involvement in a brief “CDO Connection Game” indicating that participation will take a certain amount of time but I might find both enjoyable and productive for my search for CDOs and People related to the keyword “NSTSD”, and it displays the Game Value Proposition.
Prior to this, the “Personal Coach” agent will have activated the “CDO Connection” Agent to go through step (A1), and selected the 3 most “relevant” CDOs and the 3 most “relevant” Members identified by the CDO Connection Agent. The CDO Connection Game proposed to the user will use this input as a parameter and achieve to bring you in closer connection with both relevant CDOs and Members.

**Important Note:**
This scenario assumes that there are CDOs or Members in which NSTSD is mentioned somewhere.

**If there is none,** the Concierge Agent suggests and explains to the user how by adding “NSTSD” as a new Competence, automatically he will take care of letting people know that this a new interesting Competence, and that if you add CDOs concerning NSTSD (even a CDO of the type “Wanted” – let’s assume that a Field in each CDO indicates its Status as either “Wanted”, or “Available”, or “Obsolete”), this could contribute in attracting other people’s attention towards NSTSD and the fact that you are interested in it.

**If there are too many** (which is only a problem in the Network Navigation Approach) then the “Connection Agent” will provide a suggestion like A2, or advise the user to narrow down to a given Type or Subtype of CDOs.

(2) People who “know” People with the characteristics of (1). In fact the result of (1), independently from the approach selected, could lead to the identification of a set of People, but these might be not “connected” to me (through some P-P Relationship).

**Network Navigation Approach:**
(N4) After visualizing all the People, I narrow down the search by selecting the option “Display Only”, indicating the entry ”My Network” and a “Separation Degree” (1,2, .., any) as the only Members to be displayed. By changing/increasing the Degree of Separation, I am hence able to identify who in my own network (people I know) is the most relevant to contact, as he knows somebody, who knows somebody …
Agent-based Approach:
(A3) A “Community Connection” Agent will propose me to identify People I know who are most likely to help my search for CDOs related to the keyword “NSTSD”. The Agent automatically will identify the minimal distance between a member of my network (people I know) and the most relevant Members identified through (A1) (with the help of the CDO Connection Agent” as described above).

Game-based Approach:
(G2) The “Personal Coach” Agent will be activated (or I activate it by providing him the keyword “NSTSD”) and suggests me the involvement in a brief “Community Connection Game” indicating that participation will take a certain amount of time but I might find it both enjoyable and productive for my search for relevant CDOs and People related to the keyword “NSTSD”, and it displays the Game Value Proposition.
In this case the Game will focus on making me aware of the Value of visualizing and using Relationship Networks to identify relevant People. At the end of the Game it is very likely that I will either automatically use the Network Navigation Approach like in (N4) as I now would know why and how, or I would consider more seriously to accept the suggestion of the Community Connection Agent like in (A3).
Chapter 4: NETWORK MANAGEMENT

Objectives
Successful communities are characterized by boundaries which protect their collective good, populated with a heterogeneous group of members to assure their liveliness and equipped with guidelines that foster ongoing interactions among its members. Although norms and rules may arise out of member interaction, policies and purpose of the community need to be communicated in order to set initial boundaries within which to act (Weber, 2004). These policies can then be renegotiated by community members as the network evolves. Task 8.4 will describe models that help explain and understand the functioning of networked communities as well as tools that help manage them, all the while preserving a maximum of user autonomy and control. It will also present policies and identify services that foster successful, self-organizing communities, including their ontological requirements. Such policies and tools are important because they allow for the emergence of network communities that are increasingly self-governed, self-organized and decentralized.

Models and methods
As far as the functioning of communities is concerned, two kinds of models may be discerned. There are models that aim at the dynamic behaviour of communities and mainly have an explanatory function. To the extent that they provide successful explanations, they may also be used as a basis for community design and management. And then there are also conceptual models or domain models that seek to make an inventory of pertinent terminology and describe the way terms are related to each other. Such models do not explain nor provide development or design guidelines; their function is to provide a useful vocabulary. In this section, we will first describe a domain model and then describe various dynamic models, that each focus on a particular aspect of communities.
Community

A learning network is, among other things, a community of people (members) who share the intention to learn something about a particular domain of knowledge. Actually, calling a learning network a community presumes already too much, as its connotation is one of people who somehow interact and have a shared history. We do not assume this to be the case up front, although it may, as a matter of contingent fact, happen to be true for some of the members. Eventually, it will become true. Either way, we assume that strengthening the social ties within a (learning) community will positively affect learning. So, through active participation in the community the learning goals people have set for themselves will be attained more effectively, more efficiently, more attractively; or, put differently, reshaping a learning network as a community enhances the quality of the members’ learning experience.

There are various ways to back up this assumption, such as social constructivist learning theories and, more generally, the notion that we as social animals—the term goes back as far as Aristotle—simply perform better in a social context. Justifying this assumption is not our present concern.

Activities and roles

The strengthening of social ties does not come about automatically. Mechanisms that allow or even stimulate the members to interact will have to be implemented. Typically, members engage in some sort of joint activity, i.e. they individually carry out tasks that fit into some overall activity. It is through their joint participation in an activity that mutual ties are strengthened. With respect to a particular activity, community members may be classified as participants and non-participants. The latter stay out of the activity entirely, may not even be aware of its taking place, the former carry out tasks. With respect to some activity, participants adopt roles that are specific to that activity (although similarly named roles are likely to occur in other activities).

For example, the activity of peer-tutoring in ad hoc, transient (sub)communities (Kester et al., submitted; Sloep et al., submitted) may take place in a learning network’s community. Those outside the ad hoc community are non-participants, those inside are participants. In the example, there are two kinds of
participants, a tutee, whose task it is to ask a question, and several peer-tutors, whose task it is to answer the tutee’s question. Asking a question, answering a question, reacting to someone’s answer, rephrasing the original question are all tasks in the overall activity of peer-tutoring.

Playing an initiation game in the course of joining a particular learning network is another example of an activity. Here the initiation game is the overall activity and the notion of a role is to be taken quite literally. Tasks are moves made in the game. A concrete example could be two opposing teams trying to find the way out of a virtual maze. The sole purpose is letting participants get to know each other. All participants may have the same role, although they are on different teams, or there may be role differentiation. Sharing bookmarks through a public site, such as Del.icio.us, is another, relatively simple example of an activity. Here every member might be a participant. There are two roles, active providers and lurkers. The entire activity consists of two tasks only, sharing a bookmark and finding someone else’s bookmarks. Lurkers do only the latter, providers do both.

With respect to learning, joint activities may be grouped into two broad categories, depending on the goals of the participants and a few other characteristics (Strijbos, 2004). On the one hand there is collaborative work, such as found in project teams. The people on such a team have different responsibilities (division of labour); each participant contributes to a single common goal such as producing a joint report or software product. As a consequence their individual tasks are somewhat synchronized in time, a bit like in online project organization. In a learning situation, the goal to be pursued is set by a teacher in the form of an assignment; often also the allotment of the work is also done by the teacher, as is the setting of an overall time-frame, often also of detailed milestones. Typically, the common end result will be assessed and no distinction will be made between individual contributions. Often, individuals will be assessed too, but that then pertains to their behaviour as a group member.

On the other hand, there is cooperative work. Participants all pursue their own private goals, there is no division of labour, and all have their own schedules they adhere to; so there’s no synchronization of individual tasks. Teachers are not involved in this, with the exception perhaps of suggesting that teaming up with someone else may be useful. Typically, only individual products are assessed, irrespective of whether they were the result of an individual or joint effort.
Participant characteristics

Participants in a particular activity need to be describable in terms that are relevant to their role in a given activity. Participants may be described in many different ways, but what matters here are the characteristics that are relevant to the activity they participate in; so this is an abstraction process. Characterizing them is a way of identifying them. Non-participants do not need to be characterized, at least with respect to the activity in question.

For example, tutees in the peer-tutoring activity are characterized as group by their asking questions. An individual tutee is characterized by the specific question he or she asks. Perhaps there are other relevant characteristics (number of questions asked, courses taken, current course), but these need not been taken into account immediately. Peer-tutors are characterized by their role as question answerers. Each tutor is more or less suitable as an answerer. Their suitability really is an aggregate of content competence, tutor competence, eligibility, and availability. Other characteristics could be taken into account, such as number of questions answered, recent history of questions answered. (Kester et al., submitted; Sloep et al., submitted). With respect to the initiation game – getting out off the maze – all participants adopt the same role within one team. The team is characterized by the progress it has made; this characterization is identical for all members on the same team. With respect to the bookmarking activity, a participant is either a provider or a consumer. A particular participant could be characterized by his or her historical record, by the total number of bookmarks contributed, by the diversity of the bookmarks, etc.

Proximate and ultimate goals

Every activity in a community has a particular purpose, i.e. the activity’s participants engage in the activity because through their participation they pursue a particular goal. One should distinguish between proximate and ultimate goals. Being part of a learning network, we assume all participants to have a similar ultimate goal, which is to become more proficient with respect to a particular aspect of the domain of knowledge that the learning network covers. The ultimate goals only differ with respect to their exact elaboration: although some learning network users may have identical ultimate goals, most will not. This variation really only means that in a learning network one may learn a variety of different things. Proximate goals are mere means to an end, to the ultimate goal. Proximate goals are therefore like instruments, they help to achieve something else. One’s proximate goal is determined by the kind of activity one
engages in, they are the goal a participant in an activity pursues. They are also role-specific. Ultimate goals are connected with activities in that activities channel the efforts members make to reach their ultimate goals. Some activities are better channels than others in that they require less effort for a similar effect. Proximate goals are the role-bound goals set by a particular activity. It is through the activity that the achievement of a proximate goal contributes to the achievement of an ultimate goal.

Pursuing a proximate goal in some activity may be a more or less effective means of moving towards the achievement of one’s ultimate goals. How effective it is depends on the activity, on its kind but also on the way it has been designed. There are many degrees of freedom in the design of any activity, at least some will affect the activity’ effectiveness.

Tutees in the peer-tutoring activity have as their proximate goal to have their question answered satisfactorily and as quickly as possible. Peer-tutors do not have that same proximate goal, theirs is to have their own questions answered when, at another moment of time they have one; or, getting a better grasp of the subject matter by explaining it to someone else. The peer-tutoring activity should be designed in such a way that questions will be answered quickly and efficiently. This brings us to questions about dynamic community behaviour and its theories and models.

**Social space**

A sound social space is characterized by affective work relationships, strong group cohesiveness, trust (i.e., perceived reliability of the word of other group members and genuine interest in the welfare of group members), respect, belonging (i.e., recognition of membership) and satisfaction (Kreijns, 2004; Nichani, 2001; Rovai, 2002). Social interaction enhances the emergence of social space. Interaction directed towards the completion of assigned tasks, however, could negatively influence aspects of this social space. When a task entails peer assessment, for example, fear of criticism or reluctance to criticize could interfere with feelings of trust (Rovai, 2002). An individual’s expectations of the community could also negatively influence social interaction and hence the emergence of social space. According to Brown (2001), individuals who felt that people needed to join voluntarily or felt that face-to-face association was necessary, only developed a sense of belonging and trust if they joined a face-to-face community of their own volition. So social interaction and, as a
consequence, the emergence of social space is facilitated only if socio-emotional-driven interaction is stimulated and not merely task-driven interaction; the same facilitation is observed when people's expectations about a community are met.

More generally still, three social prerequisites should be met in order for social interaction, in particular cooperation, to occur: (1) any two individuals must be likely to meet again in the future (continuity), (2) all individuals must be able to identify each other (recognisability) and (3) all individuals must be able to know how any other person has behaved in the past (history). If individuals only meet once, they are very much tempted to behave selfishly, which negatively influences the cooperation process. In addition, if individuals are not identifiable and no history of a person's behaviour is available, group members are more likely to act selfishly because they cannot be held accountable for their actions (Kollock, 1998).

**Relevant theories**

The social exchange theory of Thibaut and Kelly (1959) applies Skinner's behaviourism to groups. Individuals strive to maximize their rewards and minimize their costs. Within groups, individuals no longer control their outcomes. Interdependences are created: actions (tasks) of each group member potentially influence outcomes of actions (tasks) of every other group member. Members negotiate throughout their interaction to secure greater personal rewards while minimizing costs.

Systems theory (Millen, 1978; McClure, 1998; Tubbs, 2001) regards groups as systems of interacting individuals. Groups can set goals, and work towards these goals through united action. The task of the group is to analyze inputs, provide feedback to members, and generate decisions regarding group actions. The analysis is focused on the information input that is fed into the group, the processes during group work and the products that are generated as output. Inputs include any factors that are present when the group work begins, such as characteristics of individual members (skill, experience, training, motivation) and group-level factors (group structure and cohesiveness). Processes include communication, planning, conflict and leadership. The outputs include aspects
of the group’s performance (products, decisions, and errors) and changes in the factors that serve as inputs. Larger groups may be built on a number of smaller groups. This organization is initiated by the system itself, and may undergo both gradual and rapid change.

*Expectation-states theory* (Berger, Wagner & Zelditch, 1992; Wagner & Berger, 1993) focuses on the cognitive processes that occur within each individual in the group. Newcomers form an impression of the group, and search for information about the other group members. Group members search their memories for stored information about the group and tasks it must face; they take note of the actions of others and try to understand what caused the other member to act in a particular way. Group members allocate status within the group by two types of cues: specific status characteristics (i.e. qualities attested to each individual’s level of ability to perform the specific task at hand) and diffuse status characteristics (i.e. general qualities that group members think are relevant to ability and evaluation). Members with the most status-earning characteristics will rise to the top.

*Level-of-aspiration theory* (Lewin, Dembo, Festinger, & Sears, 1944; Zander, 1971) is a compromise between ideal goals that people set and more realistic expectations that they develop over time. Applied to groups, group members compare their performance to the group standards and eventually revise their strategies. A group’s level of aspiration often slightly exceeds those of individual members. Also, members raise it more after success than they lower it after failure. Difficult goals challenge members to work harder; groups that fail consistently have low group morale and high turnover in membership.

*Complexity theory* (Waldrop, 1992; Kauffman, 1995) states that critically interacting components self-organize to form potentially evolving structures exhibiting a hierarchy of emergent system properties. This theory takes the view that systems are best regarded as wholes, and studied as such, rejecting the traditional emphasis on simplification and reduction as inadequate techniques on which to base this sort of scientific work. Such techniques, whilst valuable in investigation and data collection, fail in their application at system level due to the inherent nonlinearity of strongly interconnected systems - the causes and effects are not separate and the whole is not the sum of the parts. The approaches used in complexity theory are based on a number of new mathematical techniques, originating from fields as diverse as physics, biology, artificial intelligence, politics and telecommunications, and this interdisciplinary viewpoint is the crucial aspect, reflecting the general applicability of the theory to systems in all areas.
Self-organization theory (Varela, Thompson, & Rosch, 1991; Maturana & Varela, 1992) contends that the behaviour of the system as a whole, and often of the individual parts, is a complex aggregation of the interactions of all the parts. No part controls the whole, or can even control another part outside the influence of the rest of the system. Such systems are said to be 'self-organizing' and the behaviour of aggregates of components is said to be 'emergent'. In these systems, which certainly include living organisms, ecosystems, and social or ecosocial systems, there are no isolated controlling agencies. There is no all-powerful father, boss, or king. There are no control hierarchies among components: no generals, captains, or soldiers. Self-organizing systems are inherently ‘democratic’.

Community characteristics

Communities are characterized by (1) boundaries, (2) rules, (3) monitoring possibilities and (4) sanctioning mechanisms (Kollock & Smith, 1996; Koper, et al., 2004). Successful communities have clearly defined boundaries. These boundaries protect the collective good of the community to outsiders and encourage ongoing interaction because the group members are likely to meet again. In addition, communities have a set of rules that govern the use of common resources and that point out that is responsible for producing and maintaining the collective goods. Community members should be responsible for setting and modifying these rules themselves. Individual accountability facilitates cooperation. By monitoring each other's actions in a community, community members see whether their fellow members comply with the rules; if they do, this will make them more willing to comply themselves. A transparent community with clear boundaries and rules allows group members to sanction the behaviour of other group members. This happens mostly by informal social control mechanisms but sometimes more firm measures are necessary. These measures could be as severe as banishment from the group. So, monitoring and sanctioning, if used wisely, are important facilitators of cooperative relations (Kollock & Smidt, 1996).

Community population

The thriving of a community also depends on the characteristics of the people in it. First of all, people differ with regard to their experiences with communities. Often students are divided in veterans and newbies. Brown (2001) found that veterans showed good community behaviour. They were
supporting and encouraging peers, sharing knowledge and experiences, reflecting on past learning, and sustaining friendships and/or acquaintances begun earlier. Newbies, however, depended much less on other group members and were wont to rapidly call for tutor help. They preferred a tight class structure with frequent interaction and helpful assessment from the tutor. It seems therefore wise to populate a community with both veterans and newbies. Because of their experience, veterans model good community behaviour to the newbies. Newbies can turn to veterans for support and encouragement instead of to the tutor. Although this helps to create an online community, veterans need an incentive to continue to interact with newbies. Veterans are willing to do their 'duty' in the beginning but after a while tend to restrict their communication to veterans only, which hinders community building (Brown, 2001).

Second, most people are trend-followers, but it is the trendsetters that make the difference. Nichani (2001) describes three types of trendsetters, that each could have a big influence on the thriving of a community: connectors, maven and salesmen. Connectors form the 'social glue' of a community; they are very sociable and attentive and have a talent for making friends. Mavens are the information experts that have a talent for collecting information and who are willing to tell others about it. Salesmen are persuaders, they have a tendency to reach out to the uncommitted and persuade them, in this case to join the community. The absence of these trendsetters in a community, which then consists of trend-followers only, will negatively influence elementary features such as belonging, trust and social interaction.

Finally and related to the issue of trendsetting, participants of online newsgroups differ in their inclination to either lurk or post in a community. A lurker, by definition, belongs to a community but never posts in it. The percentage of lurkers in communities is very variable (i.e., ranging from 0% to 99%; Preece, Nonneke & Andrews, 2004). For example, lurkers appear to make up 45.5% of health support communities while the lurker population in software support communities could be as high as 82% (for an overview, see Preece et al., 2004). Reasons for not posting range from 'didn't need to post', 'needed to find out about the group', 'couldn't make the software work', 'didn't like the group' to 'had nothing to offer' (Preece et al., 2004). Posters and lurkers are attracted to and join a community for the same reasons. However, posters feel their needs are better met, perceive more benefit and feel a greater sense of membership than lurkers. Partly because posters do not regard lurkers as inferior members, lurking is not necessarily a problem in active communities (see also Weber, 2004). Without a critical mass of posters, however, a community will never thrive (Preece, et al., 2004).
Community guidelines

Reward and incentive mechanisms need to be in place to encourage users to share, use and contribute knowledge. Additional policies, such as member participation, terms of use, quality standards and procedures, including their ontological requirements need to be considered.

Guidelines for fostering social space

The recognisability of users may be assured by forbidding the use of aliases such as screen names; this seems a reasonable demand to make in the context of a network devoted to learning. If one does not want to be this strict, users that go by a pseudonym should adopt one and only one persistent pseudonym, i.e. a single pseudonym they keep throughout their membership of the network and use in all interactions.

A historical record of user activities is maintained by logging all user-activities. The ones most significant for knowledge sharing - activities that reflect content competency and sharing competency - become part of the user’s profile. Content competency reflects the user’s mastery of the content within the network. Hereto, the profile contains the products that resulted from the learning activities of a user (i.e., papers, reports, assessments). Sharing competency refers to the ability of a user to satisfactorily support peers during a process of knowledge sharing. This information could be acquired by letting users rate each other's performance. To enhance individual accountability (Slavin, 1995), both content and sharing competency of a user is made visible to the members of a particular ad hoc, transient community (there seems to be no reason to stigmatize a person at this stage by making it always available within the entire network). For the same reason, rating should not be anonymous, at most singularly and persistently pseudonymous.

Continuity of contact is guaranteed by demanding that all community members are accessible. But continuity of contact only makes sense if there is extra value that having access to others. Therefore, learning network users should be allowed and stimulated to maintain a rich online identity. This should preferably be done through a digital dossier or portfolio. It should contain information on a user’s background, but it should also be updated regularly and automatically, almost as a track record of someone presence in the learning network. The portfolio is part of a user’s profile.
**Guidelines for community characteristics**

The (proximate and ultimate) goals learners have form the incentive for the process of knowledge sharing. Indirectly this goal strongly influences the amount of social interaction during knowledge sharing within the community. Clearly, a goal that can be reached by only one correct solution will elicit less social interaction than a goal that can be reached through various solutions.

Different interaction-structures can be implemented to mediate the effects of a goal on the social interaction. For example, if the goal can be reached by a limited number of solutions then a peer-tutoring structure could stimulate social interaction. King, Staffieri, and Adelgais (1998) advocate a three-step structure that consists of communication guidelines (i.e., listening, encouraging and giving feedback), an explanation procedure (i.e., the TEL WHY-procedure; telling in one’s own words, explaining why and how, and linking of content), and questioning guidelines (e.g., asking comprehension questions or thinking questions). Other examples of structuring interaction within groups are “…Group Investigation (Sharan & Sharan, 1992), Student Teams Achievement Division (Slavin, 1995), 'Jigsaw' (Aronson & Thibodeau, 1992; Bielaczyc, 2001), Structural Approach by Kagan (1994)) (each structure is a scenario to teach specific skills and, although not likewise articulated, it is implicitly assumed that no situation is identical), Progressive Inquiry (Rahikainen, Lallimo, & Hakkarainen, 2001), the use of scripts (O'Donnell, 1999; Weinberger, Fischer, & Mandl, 2001), scenarios that prescribe collaboration activity (Wessner, Pfister, & Miao, 1999), feedback rules or requirements of a minimum degree of contributions to a discussion (Harasim et al., 1995).” (fide Strijbos, 2004; p.33). From our perspective, 'high-structuring' methods such as peer-tutoring or Jigsaw are most suitable for goals that can be reached by a limited number of solutions because they guarantee a minimum amount of social interaction. 'Low-structuring' methods such as Progressive Inquiry, however, are most suitable for goals that can be reached by various solutions because these methods support rather than elicit social interaction (e.g. negotiation, argumentation) which is believed to be necessary under these circumstances.
Guidelines for the community population

Specialization of roles has been associated with effective self-organizing systems. Roles help position and clarify the relationship between members. Roles also delineate the responsibility of each member for the production or maintenance of collective goods, and to stimulate the transition of lurkers and passive members to more active poster and co-developers of knowledge.

In other words a community should consist of a mix of members with complementary expertise, all related to the goal of the community. So if, for example, 'answering a content-related question' is the goal of the community, it should consist of members with different levels of expertise related to the content-question since heterogeneity in levels of expertise can have differential effects on learning. Although King et al (1998) found that peer-tutors do not necessarily have to be more competent or more knowledgeable than their tutee counterparts; a study of Hinds, Patterson, and Pfeffer (2001) indicates that tutors equal in competence convey qualitatively different knowledge than more distant tutors. The near tutors - those who are similar to their tutees in expertise level - use more concrete statements during their interactions with the tutee. In contrast, the distant tutors - those with a higher level of expertise - convey more abstract and advanced concepts. Heterogeneity in level of expertise between members thus leads to a wide spectrum of knowledge shared in the community.

Existing practices

Virtual learning communities

Scholieren.com www.scholieren.com

Community population: www.scholieren.com is a website maintained by Dutch pupils and meant for Dutch pupils. The community has over 63.000 subscribers, who can post contributions to the site. Most contributors are between 15 and 18 years old; a few are adults. Guests are allowed to view the contents of the site. Scholieren.com dates back to 1997. According to the editors, it is one of the most popular sites for pupils.
Community characteristics: At the website, all kinds of materials are exchanged that can be useful for pupils, for example extracts. Besides, the websites contain various discussion forums, in which pupils can post their questions and problems. Their topics include anything that a pupil can come across, and include much more than education. The forums on homework are classified by subject area. Usually, contributors do not have to wait very long for reactions to their message. It is not unusual to receive five reactions within the first few hours after posting.

Social space: The discussions are moderated by one of the pupils from the website editorial staff. Moderators must be at least 15 years old. There is a distinction between a ‘moderator’ and a ‘moderator+’. A moderator is responsible for one subforum, and can move, remove, adjust and close topics. A moderator+ keeps an eye on one whole forum. A moderator+ can interfere with a subforum when the moderator hasn’t taken appropriate action. A moderator+ can also ban people from the community. Materials for exchanges are placed in a database. The main categories are book reports and papers. Pupils can search the database and they can post requests for book reports of specific books.

The success of Scholieren.com seems to be determined by several factors. One is the enormous number of subscribers. At any moment there will be a few hundred of the 63,000 subscribers online. The large number of subscribers is the result not only of the huge size of the target group, but also of the urgency of the problems that are discussed. Pupils have a lot of homework, and often they get stuck and need help. Further, the community consists mainly of peers, which makes it easier for individuals to ask questions. This is strengthened by the possibility to use a nickname (pseudonym), which almost everyone does. Finally, the community is moderated, so that disorderly and undesirable behaviour are reduced.

Fifth dimension **www.5d.org**

Community population: The Fifth Dimension (5D) is described by its founder Michael Cole as ‘a specially designed cultural medium for promoting the all-around intellectual and social development of 6- to 12-year-old children’ (Cole 1999). Children and university members can enter the community throughout the year. As a result, at any one moment the community is a mix of newcomers and old timers, in which some children have more experience with the norms and computer aspects of 5D than some Wizard’s assistants. This leads to a change in the power relations between children and adults.
Community characteristics: 5D has been developed in the United States in the eighties and it is designed to address certain long-standing problems in American education, in particular the distressingly low academic achievement of many American children, the widely perceived need for them to gain a qualitatively richer experience with new information technologies, and the failure of apparently successful educational innovations to survive beyond the period of innovation and external funding. 5D is a virtual learning environment. 5D runs parallel to the university year and the school year. Working occurs in periods of eight weeks, in which members are active in 5D between one and four days a week. Its heart is formed by activities, which are presented to the children in the form of a cardboard maze, divided into 20 rooms, each of which gives access to two activities. Three quarter of the activities is computer activities, including computer games and educational software. According to the rules of 5D (enshrined in a Constitution, which each child receives upon entering the activity system), children progress through the maze; the whole process takes from several months up to several years. In order to carry out a task, children must first consult a task card that defines progress on that task. Each task on one task card is described at three levels: beginner level, good level and expert level. Higher levels of achievement increase children’s freedom of choice in moving within the maze. They also give the child the possibility to alter their avatar, which is very plain in the beginning. Children who complete all the rooms in the maze attain expert status and access to new activities.

Social space: A very important role is played by the Wizard, the ultimate authority. The Wizard is the creator of the Constitution, helps children who experience difficulties, reprimands them in case of antisocial behaviour or working below their abilities, and settles disputes between members of the community. Children report their achievements to the Wizard, and are thus forced to explicate what they are doing. The Wizard is supported by the Wizard’s assistants. 5D is run from universities, and the Wizard and the Wizard’s assistants are university teachers and undergraduate students. Working in 5D is done from schools, youth clubs, day care, libraries and churches. Success and sustainability of 5D is defined by the interaction between 5D and the environment from which children participate. A quiet environment such as a library shows better learning results, but less chance of sustainability, as 5D is seen as a disturbing element. A noisy environment such as a youth club shows the opposite. [adapted from Cole, 1995 and 1999].

Success factors in 5D include the following. There are several non-personal mechanisms for settling disputes, such as the constitution and the Wizard. Achieving a higher level is rewarded in several ways, e.g. freedom of movement is increased, more activities come within reach, new duties and responsibilities are acquired, the avatar can be altered There is a constant flow of newcomers at all moments, resulting in more equal power relations. Success
and sustainability is also defined by the interaction between 5D and the environment from which children participate. Finally, a further interesting characteristic is the possibility of carrying out the same task at several levels of proficiency.

**Notschool www.notschool.net**

*Community population:* Users are selected by panels based on set selection criteria.

*Community characteristics:* Notschool started as an online research project aimed at young people of school age who have been out of the traditional education systems for personal or logistical reasons. Notschool looks at ways to get these people back into learning. It is aimed at those people for whom traditional alternatives such as home tutoring have not worked. It started out with a virtual community of 100 people, but is now being used in Education Authorities in the UK and overseas with over 1700 people. The participants were given the opportunity to develop their self-esteem and be reintroduced to learning, through the support of mentors, buddies, experts and the use of new technology. Four key factors distinguished the adults in Notschool.net from those in mainstream schools:

- Teams at local level were not teachers.
- They all had 24/7 access to up to date technology.
- They all had unlimited 24 hour access to broad bandwidth.
- They all had good levels of computer literacy.

*Social space:* Notschool consists of a highly structured community, with a central support team and several local teams. Each local team contains several mentors and researchers (i.e. the pupils). No titles were used so no distinction could be made between adults or those with authority. Everybody could see who was online. Every comment was attributable. Everyone could see who had read what at what time. All words and phrases relating to school were avoided or changed into more acceptable words.
**ESP network** www.esp.uva.nl

*Community population:* Teleprojects are collaborative distance learning projects designed by teachers from various countries around a part of curriculum that is thought to be mutually relevant. Leading idea of a teleproject is the combination of local research of pupils around a certain topic and exchange of, and conversation on research results with partner-schools, using a foreign language and electronic mail. Both domain specific teachers, foreign language teachers, and informatics teachers can help improve the activities of their pupils and make new educationally relevant activities possible when participating in teleprojects.

*Community characteristics:* The European Schools Project started in 1988. A central concept was introduced and refined to structure computer-supported collaborative learning between primary and secondary schools: the teleproject. The concept encompasses Internet-based collaborations between teachers and pupils around ‘conversation’ topics that are thought to be relevant for learning and teaching of all participants in the project. The topics demand active and authentic learning of the pupils, while for the collaboration a mutual foreign language, and electronic mail or Virtual Learning Environments are used.

**Professional network communities**

**Cisco Netpro**

*Community population:* Anonymous browsing of forums. Registration is required to add or reply to posts, and rate.

*Community characteristics:* There are forums for every possible topic related to networking professional. There is an expert section where experts present events on certain topics. TechTalks are live events featuring technical presentations and the opportunity for viewers to have their questions answered online. Previously broadcast TechTalks are available for viewing at your convenience.

*Social space:* Users can rate topics and indicate whether conversations contain suitable answers. Within each forum the top 5 rated users are displayed, indicating their points, average rating, and badge status. Badges can be earned by number of points. Over forums, the top experts can be listed, showing points, average rating, badge status and the number of posts with satisfactory answers.
**Existing tools**

There are several applications which provide some of the aspects or functionalities that are required for management of social networks or allow implementation and/or enforcement of policies. Some are listed below. Also mentioned are some techniques that are required for implementation of network management tools.

**Relationships**

The application should allow creating and managing expressions of personal relationships and build new ones. The FOAF (Friend of a Friend) standard can be used here.

**History of learner's activity**

General logging techniques and the use of e-portfolio systems as well as social network analysis can be used.

**Social Network Analysis**

Social network analysis (SNA) determines and visualizes the patterns in interaction between people, groups, organisations, etc in social networks. People form the nodes in the network, while the links between the nodes shown relationships or flows. There are several commercial and some non-commercial applications available to perform these analyses. Examples are Analytic Technology, Inflow, Jung, and Visone.

**Awareness and accountability**

An interesting example is Babble/Loops. It is a socially translucent system, using awareness and accountability, which support computer-mediated communication, allowing threaded and persistent conversation. A social proxy is a graphical representation of users depicting their presence and activities in relation to the conversation (Erickson et al., 1999; Erickson et al., 2006).
Recognisability

- Applications like Orkut (http://www.orkut.com), LinkedIn® (http://www.linkedin.com/), Friendster® (http://www.friendster.com/), MySpace (http://www.myspace.com) and Facebook (http://www.facebook.com) Facebook are social network sites that allow people to create their profile and make that available to others. People can link to others and can comment on each other’s profile.

- the ASA-system, under development at the Open Universiteit Nederland, that uses peer-tutoring in ad hoc, transient communities as a means to strengthen the social fabric of a learning community.

- LiveJournal (http://www.livejournal.com) offers functionality at several aspects. It is an open source content management system that lies behind successful online communities, such as LiveJournal.com. LiveJournal combines FOAF services with blogging services; based around journal it allows people to create communities. Users keep ownership and control over their space.

- ELGG, http://www elgg.org is a learning application centred around user’s profiles. When a user creates a profile it is automatically linked to others with the same interest, but also to resources. Weblogs are used for own reflections, but also communications with the community. Connections to other people and resources are used to build networks to enhance the learning experience. Users have control over how and what they present and can control who sees what.

- social bookmarking and tagging applications, such as Furl, Del.icio.us and non-commercial variants.
Methods and policies for self-organisation in the network

Successful communities are characterized by boundaries which protect their collective good, populated with a heterogeneous group of members to assure their liveliness and equipped with guidelines that foster ongoing interactions among its members. Although norms and rules may arise out of member interaction, policies and purpose of the community need to be communicated in order to set initial boundaries within which to act (Weber, 2004).

A learning network is, among other things, a community of people (members) who share the intention to learn something about a particular domain of knowledge. We assume that strengthening the social ties within a (learning) community will positively affect learning. So, through active participation in the community the learning goals people have set for themselves will be attained more effectively, more efficiently, more attractively; or, put differently, reshaping a learning network as a community enhances the quality of the members’ learning experience. Mechanisms that allow or promote strengthening of social ties involve users engaging in joint activities in different roles. Role specific user characteristics and descriptors related to a particular activity are required. Users should be recognisable and identifiable.

Ad hoc transient communities are seen as the vehicle to organise this (Kester et al., submitted; Sloep et al., submitted). Ad hoc transient communities serve a specific goal, are limited in time (i.e. dissolve when the goal has been attained, and operate according to social exchange policies that enhance social embedding and knowledge exchange.

A generic use case diagram is presented in figure 1. In the remainder of the document a detailed requirement description is given for a first prototype to supply a specific form of ad hoc transient communities; that is ad hoc transient communities for peer tutoring.
Ad hoc transient communities for peer tutoring

This section describes the requirements for ad hoc transient communities as well as the requirements for a system implementing ad hoc transient communities. Innovative educational technology and ICT are applied to create and populate ad hoc transient communities in which peer tutors instead of institutional tutors provide support to tutees. LSA technology is used to select suitable peers and possible (fragments of) answers in the learning network. The users are assisted by personal agents, and a central matchmaking agent provides the glue in the system. There are four criteria for selection of suitable tutors: content competence, tutor competence, eligibility and availability. Algorithms for these criteria are developed but need to be transformed into more flexible
and dynamic rules. The policies for population of the ad hoc transient communities to conform to the boundary, heterogeneity and accountability conditions are present implicitly in the model. The system does not describe those external systems it relies on, which should be available in the learning network; such as portfolio data to determine content competence and tutor competence; dossier data for personal preference, availability, reputation, rating scores; logging data of network use, etc.

The system distinguishes three types of actors: the learning network user (LNU), who can take on the role of tutee (i.e. a LNU, usually a learner, who has a question) or the role of tutor (i.e. a LNU or peer learner who provides an answer to a question). Every LNU is assisted by a personal agent (not necessarily embodied in one agent) who represent the LNU and acts on behalf of the LNU in both roles of tutee and tutor. The third actor, the Matchmaker agent orchestrates the processes involved in the selection of the tutor(s) and suitable answer fragments, and the population of the ad hoc transient communities.

Abbreviations used:
LNU: learning network user
LN: learning network
AN: activity node
CQ: content question, i.e. a question relating to content
ID: the LNU’s identifier that uniquely identifies the user in the learning network

The term dossier is used to refer to personal data, portfolio data and logging data that are required by the system to be able to determine content competence, tutor competence, eligibility and availability. These are not necessarily represented in one system.

The term community refers to an ad hoc transient community that is created within a learning network with the purpose to provide an answer to a content related question.
In the following paragraphs a short run-through of the system is provided in a narrative and is indicated how the main network policies are implemented in the system. A more detailed step by step approach and algorithms are provided in the description of the activity diagram. The corresponding UML use case, activity and class diagrams are provided in the appendices.

**Narrative**

Every LNU is assisted by a personal agent. The personal agent is the intermediate between the user and the learning network, sometimes acting on behalf of the user; at other times automating tasks for the user (e.g. maintaining availability records). The learning network contains one or more Matchmaking agents who deal with users' request through their personal agents. A user in a learning network does not fully understand the topic he is studying. The answer can not be found in the learning materials and the user (tutee) decides to ask a question in the learning network community. The learning network either provides a mechanism for this, or the LNU agent ensures that the question can be posed and is relayed to the learning network. Via the LNU agent the validity of the question is determined, if necessary in interaction with the user. The matchmaker agent then takes on the question and will form an ad hoc transient community, populated with the user asking the question (tutee), a number of suitable peer tutors and (fragments) of documents found in the learning network that either contain (part of) the answer or can be used as input for the answer. This process involves several steps. First the activity node is determined from which the question seems to arise, or find the first activity nodes which are most closely related to the question. This is required to be able to select peer tutors who are competent on the question subject and find the most suitable text fragments. The matchmaker then, through the LSA engine, selects suitable text fragments. The matchmaker agent also selects suitable tutors, taking four criteria into consideration i.e. content competence, tutor competence, eligibility and availability. Content competence is related to the level of mastery of activity nodes (registered in the user's portfolio or dossier) and is measured relative to the mastery of the activity nodes by the tutee and the origin activity node. For tutor competence measures like quality of contribution and rating of tutees are relevant (also related to data in dossier and portfolio). The eligibility is a measure of preference. Availability is related to time constraints, but also takes into account work load and past performance (based on data in portfolio and dossier). The matchmaker agent then invites possible tutors to participate in the ad hoc community. The question forms part of the invitation. This could entail several invitation rounds or reselection of tutors when an insufficient number of
tutors accept the invitation. Once sufficient tutors have accepted the invitation, the ad hoc community is created and populated with the question and the possible answer text fragments. Tutee and tutor are granted access to the community and engage in a discussion to arise at the answer. The tutee can rate contributions and tutors. The tutee decides when the question is sufficiently answered, or failing that, that the community can be closed. The answer and question are stored, as are the ratings. Answer and question are made available to the learning network.

**Policies**

The boundary policy is met because the goal of the ad hoc transient community is clear and tutee is responsible for closing the community; this is also communicated to the participants via the invitation and in the ad hoc community. The population of the ad hoc community with tutee and several tutors, selected on several criteria ensures heterogeneity of the community. Accountability is ensured because users need to log in, maintain a profile and portfolio, and the system logs required data. For a more extensive description of policies see also Berlanga et al. (submitted).

**Evaluation plan**

A prototypical implementation of the system has been created that will be used to evaluate the effect of the policies on the effectiveness of the ad hoc transient communities. The first pilot will focus on heterogeneity aspects as well as parameterisation of the LSA engine and general variables of the system. A new prototypical system will be build based on previous experience and outcomes of the first pilot.
Chapter 5: CONCLUSIONS

Based on the insights gained during the first 12 months (state of the art review, identification of key functionalities, prototype design), the workplan during the next 18 months reflects an increased focus/specialization on the following specific objectives:

1) Develop a Competence Observatory that will monitor and capture the competencies in different professional and academic fields, in an interoperable way, linking competencies to specific functions/professional roles. This task will focus on (a) the software implementation of the TenC Competence Observatory (b) the creation of relevant documentation for the TenC Competence Observatory (c) the internal evaluation of TenC Competence Observatory and (d) the maintenance of the TenC Competence Observatory.

2) Enhancing Competence Development Management Systems (CDMS) with Social Network based concepts and tools to provide an integral overview of competence development opportunities available to users. The components will be created in the second architectural layer and can be integrated as services at the third layer within the Ten Competence System.

3) Value-adding intelligent agents, simulation and game dynamics embedded in online competence development contexts. Design, usage analysis of simulation based dynamics in competence development context and their integration in online communities of users of CDMS, supporting (1) the reduction of search costs related to the search for relevant competencies and comp. development opportunities (both formal and informal), (2) the stimulus of intrinsic motivation for engaging in lifelong learning, and (3) the development of the capability to best use CDMS to support one’s life long learning/competence development process.
4) Research and explore policies that support the community’s capacity for self-organization while preserving the autonomy of individual uses, such that everybody should be stimulated to submit high quality contributions, react quickly, and most importantly, react/participate at all. This objective includes research and development of models and methods stimulating individuals in gradually becoming active pro-active members of virtual communities focusing on providing support for lifelong competence development. The task will describe knowledge sharing needs in networked communities other than the need for peer support, identify through a survey the most pressing ones, develop an appropriate community model for it, simulate the model to identify fitting management policies, validate the model by consulting experts, develop requirements for a service that embodies this model including the identified management policies, build a prototype service and empirically test its validity. As a final test of the practical validity of this theoretical notion, the effect of a variety of ad hoc, transient community-based knowledge sharing devices on the connectedness of a networked community will be investigated and documented.

5) Identify gaps in our knowledge in this field and develop and contribute to the knowledge in the field (e.g. through academic publications).
Chapter 2

7. Basic Skills Observatory, Available Online at: http://www.basic-skills.co.uk/, Last retrieved in 14 July 2006


20. IMS RDCEO (2002), IMS Reusable Definition of Competency or Educational Objective, Available Online at: http://imsglobal.org/competencies/index.cfm


33. Virtual Resource Center, Glossary of Terms, Available Online at: online.nwtc.edu/vrc/curric/Glossary.htm, Last retrieved in 13 April 2006

34. Australian Government – Department of the Environment and Heritage, Glossary of Terms, Available Online at:


36. Government of Western Australia - Department of education and Training, Glossary of Terms, Available Online at:


41. EC. Europass, Available Online at: http://europass.cedefop.eu.int

42. EC. European Language Portfolio, Available Online at: http://culture2.coe.int/portfolio/

43. EC. Common European Framework of Reference for Languages, (2001). Available Online at:

44. http://www.coe.int/T/E/Cultural_Co-operation/education/Languages/

Chapter 3


57. Clark N. Quinn (2005), Engaging Learning: Designing e-Learning Simulation Games forward by Marcia Conner, Pfeiffer


62. [http://www.seriousgames.org/index2.html](http://www.seriousgames.org/index2.html)
64. [http://eradc.org/papers/Learning_landscape.pdf](http://eradc.org/papers/Learning_landscape.pdf)


85. http://jheer.org/vizster/ research paper last date visited 09-06-06.

86. http://www.nelh.nhs.uk/knowledge_management/km2/social_network.asp article on Social Network Analysis, last date visited 10-06-06.


88. http://star.txstate.edu/index.php?option=com_content&task=view&id=1547 article on “Facebook allows old friends to meet jpeg-jpeg”, last date visited 01-06-06.

Chapter 4


Appendix A: IMS RDCEO Elements

The elements of IMS RDCEO specification are depicted in the Table below. In this table each element is described using the following properties:

No: The number of the data element. An element may be composed of sub-elements. The numbering scheme reflects these relationships.

Name: The descriptive name of the element.


Required: Indicates if the element is required:
- M = Mandatory Element that must be included in the data object, if the element at the higher level is included;
- C = Conditional Element. Existence is dependent on values of other Elements;
- O = Optional Element.

Multi: Multiplicity of the element:
- Single = single instance;
- Single * = single instance per language;
- Number = maximum number of times the element is repeatable;
- n = multiple occurrences allowed, no limit;
Repeatability of an element implies that all sub-elements repeat with the same element.

Value Space: A description of the set of valid values for the element.

Datatype: A description of formatting rules for the data element. Type includes the maximum length of the element.

Notes: Additional descriptive information about the element.
<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Explanation</th>
<th>Req</th>
<th>Mult</th>
<th>Value Space</th>
<th>Datatype</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Identifier</td>
<td>A globally unique label that identifies this Definition of Competency or Objective</td>
<td>M</td>
<td>Single</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>Entry</td>
<td>The value of the identifier within the identification or cataloguing scheme that designates or identifies this Definition of Competency</td>
<td>M</td>
<td>Single</td>
<td>Repertoire of ISO/IEC 10646-1:2000, as allowed by RFC 2396</td>
<td>Character String (smallest permitted maximum: 1000 characters)</td>
<td>Examples: &quot;2-7342-0318&quot;, &quot;LEAO875&quot;, &quot;<a href="http://imsglobal.org/dco/1234">http://imsglobal.org/dco/1234</a>&quot;</td>
</tr>
<tr>
<td>No</td>
<td>Name</td>
<td>Explanation</td>
<td>Req</td>
<td>Multi</td>
<td>Value Space</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>----</td>
<td>------</td>
<td>-------------</td>
<td>-----</td>
<td>-------</td>
<td>-------------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>or Educational Objective. A namespace specific string</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Title</td>
<td>Text label of this RDCEO</td>
<td></td>
<td></td>
<td>Single *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Description</td>
<td>of the Competency or Educational Objective</td>
<td></td>
<td></td>
<td>Single *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Name</td>
<td>Explanation</td>
<td>Req</td>
<td>Mult</td>
<td>Value Space</td>
<td>Datatype</td>
<td>Notes</td>
</tr>
<tr>
<td>----</td>
<td>--------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----</td>
<td>------</td>
<td>-------------</td>
<td>----------</td>
<td>-----------------------------------------------------------------------</td>
</tr>
<tr>
<td>4</td>
<td>Definition</td>
<td>A list of statements according to a particular definition model</td>
<td>O</td>
<td>Multipl e</td>
<td></td>
<td></td>
<td>e of level 4 diagnostic as specified in IETM #SCMBLK007“</td>
</tr>
<tr>
<td>4.2</td>
<td>Statement</td>
<td></td>
<td>O</td>
<td>Multipl e</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.2.1</td>
<td>Statement ID</td>
<td>A local identifying label for the Statement</td>
<td>O</td>
<td>Single</td>
<td></td>
<td>Character String (smallest permitted maximum)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Name</td>
<td>Explanation</td>
<td>Req</td>
<td>Mult</td>
<td>Value Space</td>
<td>Datatype</td>
<td>Notes</td>
</tr>
<tr>
<td>-----</td>
<td>------------------</td>
<td>------------------------------</td>
<td>-----</td>
<td>------</td>
<td>-------------</td>
<td>------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>4.2.2</td>
<td>Statement Name</td>
<td>Name of the Statement</td>
<td>O</td>
<td>Single</td>
<td></td>
<td>String</td>
<td>Examples: &quot;Condition&quot;, &quot;Action&quot;, &quot;Standard&quot;, &quot;Outcome&quot;, &quot;Criteria&quot;</td>
</tr>
<tr>
<td>4.2.3</td>
<td>Statement Text</td>
<td>Text of the statement</td>
<td>O</td>
<td>Single *</td>
<td></td>
<td>LangString</td>
<td>Example: &quot;Given a set of integer numbers in the range 1 to 49&quot;</td>
</tr>
<tr>
<td>4.2.4</td>
<td>Statement Token</td>
<td>Token value for the statement</td>
<td>O</td>
<td>Single</td>
<td></td>
<td>Vocabulary defined in definition model</td>
<td>Vocabular y (state)</td>
</tr>
<tr>
<td>5</td>
<td>Metadata</td>
<td>Embedded Metadata about this RDCEO</td>
<td>O</td>
<td>Single</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1</td>
<td>RDCEO Schema</td>
<td>Describes the schema that defines and</td>
<td>O</td>
<td>Single</td>
<td></td>
<td>Repertoire of ISO/IEC 10646-</td>
<td>Character String (smallest) If no schema element is present in a</td>
</tr>
</tbody>
</table>
Table 4: The IMS RDCEO Elements
Appendix B: HR-XML Elements

The elements of HR-XML specification are depicted in the Table below. In this table each element is described using the following properties:

No: The number of the data element. An element may be composed of sub-elements. The numbering scheme reflects these relationships.

Name: The descriptive name of the element.


Required: Indicates if the element is required:
- R = Required Element that must be included in the data object;
- C = Conditional Element. Existence is dependent on values of other Elements;
- O = Optional Element.

Multi: Multiplicity of the element:
- None = Element must appear once and only once;
- + = Element must appear one or more times. Element required to appear at least once, but multiple consecutive occurrences may be present;
- ? = Element may appear zero or one time. Element optional, but only allowed to appear once;
- * = Element may appear zero or more times. Element may appear as many times consecutively as needed, or even zero times;

Datatype: A description of formatting rules for the data element. Type includes the maximum length of the element and a will also include a description of the set of valid values for the sub-element.

Notes: Additional descriptive information about the element.

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Explanation</th>
<th>Req</th>
<th>Multi</th>
<th>Datatype</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Competency</td>
<td>A specific, identifiable, definable, and</td>
<td>R</td>
<td></td>
<td>complexType</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Explanation</td>
<td>Req</td>
<td>Multi</td>
<td>Datatype</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>----</td>
<td>-------------</td>
<td>-----</td>
<td>-------</td>
<td>----------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>measurable knowledge, skill, ability and/or other deployment-related characteristic (e.g. attitude, behavior, physical ability) which a human resource may possess and which is necessary for, or material to, the performance of an activity within a specific business context.</td>
<td>O</td>
<td>O</td>
<td>xsd:string</td>
<td>Example: &quot;College Degree&quot;</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>The name for the related component.</td>
<td>O</td>
<td>?</td>
<td>xsd:boolean</td>
<td>A boolean used to indicate whether the</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>This optional attribute is available to provide additional information about the Id.</td>
<td>O</td>
<td>?</td>
<td>xsd:boolean</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Example: "College Degree"
<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Explanation</th>
<th>Req</th>
<th>Mul</th>
<th>Datatype</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>CompetencyId</td>
<td>Competency Evidence is mandatory for a particular position or given context.</td>
<td>O</td>
<td>?</td>
<td>complexType</td>
<td></td>
</tr>
<tr>
<td></td>
<td>id</td>
<td>An identification code assigned to identify or classify the Competency. A</td>
<td>O</td>
<td>xsd:string</td>
<td>Example: &quot;233&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>taxonomy might include an identification code for each</td>
<td>O</td>
<td>xsd:string</td>
<td>Example: &quot;Acme Company&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Competency or identification codes might be agreed upon by trading</td>
<td>O</td>
<td>xsd:string</td>
<td>Example: &quot;Competency id is based on Acme internal taxonomy&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>description</td>
<td>partners.</td>
<td>O</td>
<td>?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>TaxonomyId</td>
<td></td>
<td>O</td>
<td>*</td>
<td>complexType</td>
<td></td>
</tr>
<tr>
<td></td>
<td>id</td>
<td>A code that identifies the taxonomy.</td>
<td>O</td>
<td>xsd:string</td>
<td>Example: &quot;1&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>idOwner</td>
<td></td>
<td>O</td>
<td>xsd:string</td>
<td>Example: &quot;Acme Company&quot;</td>
<td></td>
</tr>
</tbody>
</table>
|    | description   |                                                                               | O   | xsd:string | Example: "My ids are
<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Explanation</th>
<th>Req</th>
<th>Mult</th>
<th>Datatype</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Competency Evidence</td>
<td></td>
<td>O</td>
<td>*</td>
<td>complexType</td>
<td>based on Acme Company Taxonomy&quot;</td>
</tr>
<tr>
<td>6.1</td>
<td>dateOfIncident</td>
<td>The date on which the Competency Evidence first establishes the existence of the Competency.</td>
<td>O</td>
<td>?</td>
<td>AnyDateTimeType</td>
<td>Example: &quot;1992-05-21&quot;</td>
</tr>
<tr>
<td>6.2</td>
<td>name</td>
<td>The name for the related component.</td>
<td>O</td>
<td>?</td>
<td>xsd:string</td>
<td>Example: &quot;Degree&quot;</td>
</tr>
<tr>
<td>6.3</td>
<td>typeDescription</td>
<td>A description of the type of Competency Evidence</td>
<td>O</td>
<td>?</td>
<td>xsd:string</td>
<td>Example: &quot;College Degree&quot;</td>
</tr>
<tr>
<td>6.4</td>
<td>expirationDate</td>
<td>The identification of any applicable expiration date, such as the date that a license or certification expires.</td>
<td>O</td>
<td>?</td>
<td>AnyDateTimeType</td>
<td>Example: &quot;1996-05-21&quot;</td>
</tr>
<tr>
<td>No</td>
<td>Name</td>
<td>Explanation</td>
<td>Req</td>
<td>Mut</td>
<td>Datatype</td>
<td>Notes</td>
</tr>
<tr>
<td>-----</td>
<td>--------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----</td>
<td>-----</td>
<td>-------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td>6.5</td>
<td>typeId</td>
<td>A code identifying the type of CompetencyEvidence.</td>
<td>O</td>
<td>?</td>
<td>xsd:string</td>
<td>Example: &quot;231&quot;</td>
</tr>
<tr>
<td>6.6</td>
<td>required</td>
<td>A boolean used to indicate whether the CompetencyEvidence is mandatory for a particular position or given context.</td>
<td>O</td>
<td>?</td>
<td>xsd:boolean</td>
<td>Example: &quot;&quot;</td>
</tr>
<tr>
<td>6.7</td>
<td>lastUsed</td>
<td>A requirement or assertion for the date on which the Competency was last used.</td>
<td>O</td>
<td>?</td>
<td>AnyDateTimeType</td>
<td>Example: &quot;1995-01-01&quot;</td>
</tr>
<tr>
<td>6.8</td>
<td>EvidenceId</td>
<td></td>
<td>O</td>
<td>?</td>
<td>complexType</td>
<td></td>
</tr>
<tr>
<td>6.8.1</td>
<td>id</td>
<td>A code that identifies the CompetencyEvidence.</td>
<td>O</td>
<td>?</td>
<td>xsd:string</td>
<td>Example: &quot;100&quot;</td>
</tr>
<tr>
<td>6.8.2</td>
<td>idOwner</td>
<td>A code that identifies the CompetencyEvidence.</td>
<td>O</td>
<td>?</td>
<td>xsd:string</td>
<td>Example: &quot;University of Wisconsin&quot;</td>
</tr>
<tr>
<td>6.8.3</td>
<td>description</td>
<td></td>
<td>O</td>
<td>?</td>
<td>xsd:string</td>
<td>Example: &quot;Bachelor's&quot;</td>
</tr>
<tr>
<td>No</td>
<td>Name</td>
<td>Explanation</td>
<td>Req</td>
<td>Mul</td>
<td>Datatype</td>
<td>Notes</td>
</tr>
<tr>
<td>-----</td>
<td>---------------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----</td>
<td>-----</td>
<td>-------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>6.9</td>
<td>NumericValue</td>
<td>NumericValue is the required or measured level for the competency. The content of NumericValue is a rating value.</td>
<td>O</td>
<td></td>
<td></td>
<td>degree from accredited school&quot;</td>
</tr>
<tr>
<td>6.9.1</td>
<td>minValue</td>
<td>The minimum value of the rating scale.</td>
<td>O</td>
<td>?</td>
<td>xsd:double</td>
<td>Example: &quot;0&quot;</td>
</tr>
<tr>
<td>6.9.2</td>
<td>maxValue</td>
<td>The maximum value of the rating scale.</td>
<td>O</td>
<td>?</td>
<td>xsd:double</td>
<td>Example: &quot;1&quot;</td>
</tr>
<tr>
<td>6.9.3</td>
<td>interval</td>
<td>The increment or step for the relevant scale.</td>
<td>O</td>
<td>?</td>
<td>xsd:double</td>
<td>Example: &quot;0.1&quot;</td>
</tr>
<tr>
<td>6.9.4</td>
<td>description</td>
<td>This optional attribute is available to provide additional information about the Id.</td>
<td>O</td>
<td>?</td>
<td>xsd:string</td>
<td>Example: &quot;Scale of 0 or 1&quot;</td>
</tr>
<tr>
<td>6.10</td>
<td>StringValue</td>
<td>StringValue is the</td>
<td>O</td>
<td></td>
<td></td>
<td>Example:</td>
</tr>
<tr>
<td>No</td>
<td>Name</td>
<td>Explanation</td>
<td>Req</td>
<td>Mul</td>
<td>Datatype</td>
<td>Notes</td>
</tr>
<tr>
<td>----</td>
<td>--------------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----</td>
<td>-----</td>
<td>----------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>required or measured level for the competency. The content of</td>
<td></td>
<td></td>
<td></td>
<td>&quot;One&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>StringValue is a rating value.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.10.1</td>
<td>minValue</td>
<td>The minimum value of the rating scale.</td>
<td>O</td>
<td>?</td>
<td>xsd:string</td>
<td>Example: &quot;Zero&quot;</td>
</tr>
<tr>
<td>6.10.2</td>
<td>maxValue</td>
<td>The maximum value of the rating scale.</td>
<td>O</td>
<td>?</td>
<td>xsd:string</td>
<td>Example: &quot;One&quot;</td>
</tr>
<tr>
<td>6.10.3</td>
<td>description</td>
<td>This optional attribute is available to provide additional information</td>
<td>O</td>
<td>?</td>
<td>xsd:string</td>
<td>Example: &quot;Scale of zero or one&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>about the Id.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.11</td>
<td>SupportingInfomation</td>
<td>Contains additional descriptive information to substantiate or clarify a</td>
<td>O</td>
<td>*</td>
<td>xsd:string</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>rating, measure, value, etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>CompetencyWeight</td>
<td>NumericValue is the</td>
<td>O</td>
<td>*</td>
<td>complexType</td>
<td>Example:</td>
</tr>
<tr>
<td>7.1</td>
<td>NumericValue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Name</td>
<td>Explanation</td>
<td>Req</td>
<td>Mut</td>
<td>Datatype</td>
<td>Notes</td>
</tr>
<tr>
<td>-----</td>
<td>---------------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----</td>
<td>-----</td>
<td>-----------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>7.1</td>
<td>minValue</td>
<td>The minimum value of the rating scale.</td>
<td>O</td>
<td>?</td>
<td>xsd:double</td>
<td>Example: &quot;0&quot;</td>
</tr>
<tr>
<td>7.2</td>
<td>StringValue</td>
<td>StringValue is the required or measured level for the competency. The content of StringValue is a</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.1.1</td>
<td>explanation</td>
<td>The minimum value of the rating scale.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.1.2</td>
<td>maxValue</td>
<td>The maximum value of the rating scale.</td>
<td>O</td>
<td>?</td>
<td>xsd:double</td>
<td>Example: &quot;100&quot;</td>
</tr>
<tr>
<td>7.1.3</td>
<td>interval</td>
<td>The increment or step for the relevant scale.</td>
<td>O</td>
<td>?</td>
<td>xsd:double</td>
<td>Example: &quot;0.5&quot;</td>
</tr>
<tr>
<td>7.1.4</td>
<td>description</td>
<td>This optional attribute is available to provide additional information about the Id.</td>
<td>O</td>
<td>?</td>
<td>xsd:string</td>
<td>Example: &quot;Acme Company Scale 100 point&quot;</td>
</tr>
</tbody>
</table>

No: required or desired level for the competency. The content of NumericValue is a rating value.

"90": The minimum value of the rating scale.

"0": The maximum value of the rating scale.

"0.5": The increment or step for the relevant scale.

"Acme Company Scale 100 point": This optional attribute is available to provide additional information about the Id.
<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Explanation</th>
<th>Req</th>
<th>M ult</th>
<th>Datatype</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.2.1</td>
<td>minValue</td>
<td>The minimum value of the rating scale.</td>
<td>O</td>
<td>?</td>
<td>xsd:string</td>
<td>Example: “Zero”</td>
</tr>
<tr>
<td>7.2.2</td>
<td>maxValue</td>
<td>The maximum value of the rating scale.</td>
<td>O</td>
<td>?</td>
<td>xsd:string</td>
<td>Example: “One hundred”</td>
</tr>
<tr>
<td>7.2.3</td>
<td>description</td>
<td>This optional attribute is available to provide additional information about the Id.</td>
<td>O</td>
<td>?</td>
<td>xsd:string</td>
<td>Example: &quot;Acme Company Scale 100 point&quot;</td>
</tr>
<tr>
<td>7.3</td>
<td>SupportingInf ormation</td>
<td>Contains additional descriptive information to substantiate or clarify a rating, measure, value, etc.</td>
<td>O</td>
<td>*</td>
<td>xsd:string</td>
<td></td>
</tr>
<tr>
<td>7.4</td>
<td>type</td>
<td>Identifies the type of CompetencyWeight. Enumerated values are: levelOfInterest (A level of interest asserted or required for the competency) and skillLevel (A</td>
<td>O</td>
<td>?</td>
<td>xsd:string</td>
<td>Example: &quot;levelOfInterest&quot;</td>
</tr>
<tr>
<td>No</td>
<td>Name</td>
<td>Explanation</td>
<td>Req</td>
<td>Mul</td>
<td>Datatype</td>
<td>Notes</td>
</tr>
<tr>
<td>----</td>
<td>--------</td>
<td>----------------------------------------------------------------------------</td>
<td>-----</td>
<td>-----</td>
<td>---------------</td>
<td>-------</td>
</tr>
<tr>
<td>8</td>
<td>Competency</td>
<td>One competency might be decomposed into several component competencies, each of which might be separately measurable</td>
<td>O</td>
<td>*</td>
<td>complexType</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>UserArea</td>
<td>Additional personal information</td>
<td>O</td>
<td>?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 5: The HR-XML Elements**
Appendix C: Proposed CDM binding based on the IMS RDCEO and HR-XML Mapping

C1: Narrative Description of XML Binding

C1.1: Competency

Description: The root element is called competency and contains a single reusable definition.

Multiplicity: The root element <competency> element may appear only once per instance.

Attributes: None

Elements:
- <Identifier>
- <Title>
- <Description>
- <ProficiencyLevel>

Figure 28: <Competency> Elements
C1.1.1.1: Identifier

**Description:** The `<Identifier>` element of CDM model consists of two more elements that hold the appropriate information for the identification of the competency.

**Multiplicity:** The `<Identifier>` element may appear only once per instance.

**Attributes:** None

**Elements:**
- `<Catalog>`: The name or designator of the identification or cataloguing scheme for this entry. This element may appear only once.
- `<Entry>`: The value of the identifier within the identification or cataloguing scheme that designates or identifies this definition of competency. This element may appear only once.

C1.1.1.2: Title

**Elements:**
- `<longstring>`: The value of the identifier within the identification or cataloguing scheme that designates or identifies this definition of competency. This element may appear only once.
Description: A short name for this competency. The `<Title>` element may appear only once per instance.

Attributes: None

Elements:
- `<Langstring>`: The name for a competency, repeated in multiple languages.

C1.1.1.3: Description

![Figure 31: <Description> Element](image)

Description: A narrative description of the competency or educational objective. The `<Description>` element may appear in multiple languages.

Multiplicity: The `<Description>` element may appear only once per instance.

Attributes: None

Elements:
- `<Langstring>`: The description for a competency, repeated in multiple languages.

C1.1.1.4: ProficiencyLevel
Description: The `<ProficiencyLevel>` is used to describe the proficiency level of the competency and may appear zero or more times. The `<ProficiencyLevel>` element contains one element, the `<Level>` element that may appear one or more times. The `<Level>` element consists of three elements and one attribute and may appear one or more times.

Attributes:
- `<Type>`: The type of the proficiency level, enumerated as “Knowledge Level”, “Skill Level” and “Attitude Level”.

Elements:
- None
- `<Title>`: The title of the proficiency level may be repeated in multiple languages (see also Figure 15).
- `<Description>`: The description of the proficiency level may be repeated in multiple languages (see also Figure 16).
- `<Value>`: The description of the rating scale.

C1.1.1.4.1: VALUE

Description: The `<Value>` element of CDM model consists of two other elements and holds information about the rating value of the proficiency level.

Multiplicity: The `<NumericValue>` element may appear one or more times.

Figure 32: `<ProficiencyLevel>` Elements

Figure 33: `<Value>` Elements
Attributes: None

Elements:
- `<NumericValue>`
- `<StringValue>`

C1.1.4.1.1: NumericValue

![Diagram of NumericValue elements]

**Description:** The `<NumericValue>` element of CDM model consists of four elements and is the required or measured level for the competency. The content of NumericValue is a rating value.

**Multiplicity:** The `<NumericValue>` element may appear only once.

Attributes: None

Elements:
- `<MinValue>`: The minimum value of the rating scale
• **<MaxValue>:** The maximum value of the rating scale.
• **<Interval>:** The increment or step for the relevant scale.
• **<SuccessThreshold>:** The minimum value of the proficiency level that proves the existence of the competency.
• **<Description>:** The description of the rating scale.

**C1.1.4.1.2: StringValue**

**Description:** The `<StringValue>` element of CDM model consists of four elements and is the required or measured level for the competency. The content of NumericValue is a rating value but in a narrative form.

**Multiplicity:** The `<NumericValue>` element may appear zero or more time.

**Attributes:** None

**Elements:**
- **<MinValue>:** The minimum value of the rating scale
- **<MaxValue>:** The maximum value of the rating scale.
- **<SuccessThreshold>**: The minimum value of the proficiency level that proves the existence of the competency.
- **<Description>**: The description of the rating scale.
- **<States>**: The <States> element consists of one element, namely, the <State> element that is used to capture the proficiency levels of the competency, as an ordered list based on the priority of each level.

### C1.1.1.5: Classification

![Diagram of Classification Elements](image)

**Description**: The <Classification> element is used to describe where this competency falls within a particular classification system and may appear zero or more times. The <Classification> element contains one element, the <Taxonomy> element that may appear one or more times. The <Taxonomy> element consists of three elements and may appear one or more times.

**Attributes**: None

**Elements**:
- **<Id>**: A unique identifier for the competency’s taxonomy.
- **<OwnerId>**: The name of the identification for the related entry.
- **<Description>**: A short description about the identification of the competency’s taxonomy.

### C1.1.1.6: Relation
Description: The <Relation> element is used to relate this competency with others competencies and may appear zero or more times. The <Relation> element contains one element, the <Subcompetency> element that may appear one or more times. The <Subcompetency> element consists of one element and may appear one or more times.

Attributes: None

Elements:
- <Identifier>: A unique identifier that links the competency with the subcompetencies.

C2: XML Schema of CDM

```xml
<?xml version="1.0" encoding="UTF-8"?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <xsd:annotation>
    <xsd:documentation>
      Name: CDM.xsd
      Date this version: 2006-04-03
      Purpose: Defines the Competencies Schema
      Author(s): CERTH
      Documentation: Competency Description Model.doc
    </xsd:documentation>
  </xsd:annotation>
  <xsd:element name="States">
    <xsd:complexType>
      <xsd:sequence>
        <xsd:element name="State" type="xsd:string" maxOccurs="unbounded"/>
      </xsd:sequence>
    </xsd:complexType>
  </xsd:element>
</xsd:schema>
```
TEN WP8 – Competence Observatory, 
Overview Tool, Agents, Games and 
Network Management

<xsd:complexType>
  <xsd:element name="langstring">
    <xsd:complexType>
      <xsd:simpleContent>
        <xsd:extension base="xsd:string">
          <xsd:attribute name="##other" processContents="strict"/>
        </xsd:extension>
      </xsd:simpleContent>
    </xsd:complexType>
  </xsd:element>
  <xsd:element name="Description">
    <xsd:complexType>
      <xsd:sequence>
        <xsd:element ref="langstring" maxOccurs="unbounded"/>
      </xsd:sequence>
    </xsd:complexType>
  </xsd:element>
  <xsd:element name="Title">
    <xsd:complexType>
      <xsd:sequence>
        <xsd:element ref="langstring" maxOccurs="unbounded"/>
      </xsd:sequence>
    </xsd:complexType>
  </xsd:element>
  <xsd:element name="StringValue">
    <xsd:complexType>
      <xsd:sequence>
        <xsd:element name="MinValue" type="xsd:string"/>
        <xsd:element name="MaxValue" type="xsd:string"/>
      </xsd:sequence>
    </xsd:complexType>
  </xsd:element>
</xsd:complexType>
Appendix D: Examples of using IMS RDCEO

Example 1: Definition of the A1 Level of the Listening Language Skill

The Europass Language Passport defines common reference levels for the description of language proficiency levels based on a six level scale retrieved from the Common European Framework of Reference for Languages [39]. These levels are: level A1 and A2 for basic users, level B1 and B2 for independent users and level C1 and C2 for proficient users. The below example illustrates the use of IMS RDCEO specification in expressing A1 Level of the Listening Language Skill that premise two other skills. The skill of overall listening comprehension and the skill of listening to announcements and instructions.

```xml
<?xml version="1.0" encoding="ISO-8859-7"?>
<rdceo>
  <identifier>============================</identifier>
  <title>
    <langstring xml:lang="en">European A1 Listening Language Skill</langstring>
  </title>
  <description>
    <langstring xml:lang="en">Can understand familiar words and very basic phrases concerning myself, my family and immediate concrete surroundings when people speak slowly and clearly</langstring>
  </description>
  <definition>
    <model>http://culture2.coe.int/portfolio/documents/0521803136txt.pdf</model>
    <statement statementid="1" statementname="Content Area">
      <statementtext>
        <langstring xml:lang="en">Language Skills</langstring>
      </statementtext>
    </statement>
    <statement statementid="2" statementname="Performance Indicator">
      <statementtext>
        <langstring xml:lang="en">Overall listening comprehension: Can follow speech which is very slow and carefully articulated, with long pauses for him/her to assimilate meaning</langstring>
      </statementtext>
    </statement>
  </definition>
</rdceo>
```
Example 2: Definition of the A Level Reading Language Skill

As it has already been said, the A Level Basic User consists of two sub-levels, namely the A1 Level and A2 Level Language Skills. The below example illustrates the use of IMS RDCEO specification in expressing A Level Reading Language Skill which is an aggregation of A1 Reading Language Skill and A2 Reading Language Skill.

```xml
<xml version="1.0" encoding="ISO-8859-7"/>
<rdceo>
  <identifier>-----------------------------------------------</identifier>
  <title>
    <langstring xml:lang="en">European A Level Reading Language Skills</langstring>
  </title>
  <description>
    <langstring xml:lang="en">-----------------------------------------------</langstring>
  </description>
  <definition>
    <model>http://culture2.coe.int/portfolio/documents/0521803136txt.pdf</model>
    <statement statementid="1" statementname="Content Area">
      <statementtext>

Figure 38: Describing the “A1 Level of the Listening Language Skill” of the Europass Language Passport using the IMS RDCEO Specification
European A1 Reading Language Skill: Can understand familiar names, words and very simple sentences, for example on notices and posters or in catalogues.
Example 3: Definition of the Speaking Language Skill

The Europass Language Passport separates the Language Competencies/Skills into three core Levels. The first level is the Understanding Level. It is a complex Level and consists of two other Levels, the Listening Level and the Reading Level. The second core Level is the Speaking Level which is a complex Level too and consists of two more Levels, the Spoken Interaction Level and the Spoken Production Level. Ending, the third Level is the Writing Level which is a stand alone Level, so it is not analyzed farther (see also Fig. 2). The below example illustrates the use of IMS RDCEO specification in expressing the Speaking Level of Language Skill.

```xml
<?xml version="1.0" encoding="ISO-8859-7"?>
<rdceo>
  <identifier>============================</identifier>
  <title><langstring xml:lang="en">European Speaking Language Skills</langstring></title>
</rdceo>
```
Language Skills

European Spoken Interaction Language Skill
Example 4: Definition of the Europass Language Passport Language Skill

As it has already been said in the above example, the Europass Language Passport separates the Language Competencies/Skills into three core Levels. The Understanding Level, the Speaking Level and the Writing Level (see also Fig. 2). The below example illustrates the use of IMS RDCEO specification in expressing this specific resolution of the Language Competencies/Skills.

```xml
<?xml version="1.0" encoding="ISO-8859-7"?>
<rdceo>
  <identifier>-------------------------------------</identifier>
  <title>
    <langstring xml:lang="en">European Language Skills</langstring>
  </title>
  <description>
    European Spoken Production Language Skill
  </description>
</rdceo>
```
Figure 41: Describing the “Language Skill Components” of the Europass Language Passport using the IMS RDCEO specification
Appendix D: Examples of using HR-XML

Example 1: Definition of the A1 Level of the Listening Language Skill

The Europass Language Passport defines common reference levels for the description of language proficiency levels based on a six level scale retrieved from the Common European Framework of Reference for Languages [39]. These levels are: level A1 and A2 for basic users, level B1 and B2 for independent users and level C1 and C2 for proficient users. The below example illustrates the use of HR-XML in expressing A1 Level of the Listening Language Skill that premise two other skills. The skill of overall listening comprehension and the skill of listening to announcements and instructions.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Competency name="European Listening Language Skills" description="Can understand familiar words and very basic phrases concerning myself, my family and immediate concrete surroundings when people speak slowly and clearly">
  <CompetencyWeight>
    <StringValue minValue="A1" maxValue="C2" description="Six Level Scale">A1 Level</StringValue>
  </CompetencyWeight>
</Competency>

<Competency name="Overall listening comprehension" description="Can follow speech which is very slow and carefully articulated, with long pauses for him/her to assimilate meaning">
  <CompetencyWeight>
    <StringValue minValue="A1" maxValue="C2" description="Six Level Scale">A1 Level</StringValue>
  </CompetencyWeight>
</Competency>

<Competency name="Listening to announcements and instructions" description="Can understand instructions addressed carefully and slowly to him/her and follow short, simple directions">
  <CompetencyWeight>
    <StringValue minValue="A1" maxValue="C2" description="Six Level Scale">A1 Level</StringValue>
  </CompetencyWeight>
</Competency>

Figure 42: Describing the “A1 Level of the Listening Language Skill” of the Europass Language Passport using the HR-XML specification
Example 2: Definition of the A Level Reading Language Skill

As it has already been said, the A Level Basic User consists of A1 Level and A2 Level Skills. The below example illustrates the use of HR-XML specification in expressing A Level Reading Language Skill which is an aggregation of A1 Reading Language Skill and A2 Reading Language Skill.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Competency name="European Reading Language Skills" description="Can understand familiar words and very basic phrases concerning myself, my family and immediate concrete surroundings when people speak slowly and clearly">
  <CompetencyWeight>
    <StringValue minValue="A1" maxValue="C2" description="Six Level Scale">A Level</StringValue>
  </CompetencyWeight>
</Competency>

<Competency name="European Reading Language Skill" description="Can understand familiar names, words and very simple sentences, for example on notices and posters or in catalogues">
  <CompetencyWeight>
    <StringValue minValue="A1" maxValue="C2" description="Six Level Scale">A1 Level</StringValue>
  </CompetencyWeight>
</Competency>

<Competency name="European Reading Language Skill" description="Can read very short, simple texts. Can find specific, predictable information in simple everyday material such as advertisements, prospectuses, menus and timetables, and can understand short simple personal letters">
  <CompetencyWeight>
    <StringValue minValue="A1" maxValue="C2" description="Six Level Scale">A2 Level</StringValue>
  </CompetencyWeight>
</Competency>
```

Figure 43: Describing the “A Level of the Reading Language Skill” of the Europass Language Passport using the HR-XML specification

Example 3: Definition of the Speaking Language Skill

The Europass Language Passport separates the Language Competencies/Skills into three core Levels. The first level is the Understanding Level and consists of two other Levels, the Listening Level and the Reading Level. The second core Level is the Speaking Level which is a complex Level too and consists of two more Levels, the Spoken Interaction Level and the Spoken Production Level. Ending, the third Level is the Writing Level which is a stand alone Level, so
it is not analyzed farther (see also Fig. 2). The below example illustrates the use of HR-XML specification in expressing the Speaking A Level of Language Skill.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Competency name="European Speaking Language Skills" description="Can understand familiar words and very basic phrases concerning myself, my family and immediate concrete surroundings when people speak slowly and clearly">
  <CompetencyWeight>
    <StringValue minValue="A1" maxValue="C2" description="Six Level Scale"/>
  </CompetencyWeight>
</Competency>
<Competency name="European Spoken Interaction Language Skill">
  <CompetencyWeight>
    <StringValue minValue="A1" maxValue="C2" description="Six Level Scale"/>
  </CompetencyWeight>
</Competency>
<Competency name="European Spoken Production Language Skill">
  <CompetencyWeight>
    <StringValue minValue="A1" maxValue="C2" description="Six Level Scale"/>
  </CompetencyWeight>
</Competency>
</Competency>
```

**Figure 44:** Describing the “Speaking Language Skill” of the Europass Language Passport using the HR-XML specification

**Example 4: Definition of the Europass Language Passport Language Skill**

As it has already been said in the above example, the Europass Language Passport separates the Language Competencies/Skills into three core Levels. The Understanding Level, the Speaking Level and the Writing Level (see Fig. 2). The below example illustrates the use of HR-XML specification in expressing this specific resolution of the Language Competencies/Skills.

```xml
<?xml version="1.0" encoding="UTF-8"?>
```
Figure 45: Describing the “Language Skill” of the Europass Language Passport using the HR-XML specification

Appendix F: Examples of using the proposed CDM

In this appendix we use the Europass Language Passport, the Europass Mobility and the Europass CV in order to illustrate the use of our Competence Model in a real case study.
The Europass Language Passport

Example 1: Definition of the A1 Level of the Listening Language Skill

<?xml version="1.0" encoding="UTF-8"?>
<Competency xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="G:\CDM_CERTH.xsd">
  <Identifier>
    <Catalog>URL</Catalog>
    <Entry>http://culture2.coe.int/portfolio/documents/0521803136txt.pdf</Entry>
  </Identifier>
  <Title>
    <langstring xml:lang="en">European A1 Listening Language Skill</langstring>
  </Title>
  <Description>
    <langstring xml:lang="en">Can understand familiar words and very basic phrases concerning myself, my family and immediate concrete surroundings when people speak slowly and clearly</langstring>
  </Description>
  <ProficiencyLevel>
    <Level Type="KnowledgeLevel">
      <Title>
        <langstring xml:lang="en">Overall listening comprehension</langstring>
      </Title>
      <Description>
        <langstring xml:lang="en">Can follow speech which is very slow and carefully articulated, with long pauses for him/her to assimilate meaning</langstring>
      </Description>
      <Value>
        <NumericValue>
          <MinValue>1</MinValue>
          <MaxValue>10</MaxValue>
          <Interval>1</Interval>
          <SuccessThreshold>3</SuccessThreshold>
        </NumericValue>
      </Value>
    </Level>
  </ProficiencyLevel>
</Competency>
Figure 46: Describing the “A1 Level of the Listening Language Skill” of the Europass Language Passport using the CDM
Example 2: Definition of the A Level Reading Language Skill

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Competency xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="G:\CDM_CERTH.xsd">
  <Identifier>
    <Catalog>URL</Catalog>
    <Entry>http://culture2.coe.int/portfolio/documents/0521803136txt.pdf</Entry>
  </Identifier>
  <Title>
    <langstring xml:lang="en">European Reading Language Skills</langstring>
  </Title>
  <Description>
    <langstring xml:lang="en">A Level Reading Language Skill is an aggregation of A1 Reading Language Skill and A2 Reading Language Skill</langstring>
  </Description>
  <ProficiencyLevel>
    <Level Type="KnowledgeLevel">
      <Title>
        <langstring xml:lang="en">European A1 Reading Language Skill</langstring>
      </Title>
      <Description>
        <langstring xml:lang="en">Can understand familiar names, words and very simple sentences, for example on notices and posters or in catalogues</langstring>
      </Description>
      <Value>
        <NumericValue>
          <MinValue>1</MinValue>
          <MaxValue>10</MaxValue>
          <Interval>1</Interval>
          <SuccessThreshold>3</SuccessThreshold>
        </NumericValue>
      </Value>
    </Level>
  </ProficiencyLevel>
</Competency>
```
<Level Type="KnowledgeLevel">
  <Title>
    <langstring xml:lang="en">European A2 Reading Language Skill</langstring>
  </Title>
  <Description>
    <langstring xml:lang="en">Can read very short, simple texts. Can find specific, predictable minformation in simple everyday material such as advertisements, prospectuses, menus and timetables, and can understand short simple personal letters</langstring>
  </Description>
  <Value>
    <NumericValue>
      <MinValue>1</MinValue>
      <MaxValue>10</MaxValue>
      <Interval>1</Interval>
      <SuccessThreshold>3</SuccessThreshold>
    </NumericValue>
  </Value>
</Level>
</ProficiencyLevel>
</Classification>
</Taxonomy>
</Competency>

Figure 47: Describing the “A Level of the Reading Language Skill” of the Europass Language Passport using the CDM

Example 3: Definition of the Speaking Language Skill

<?xml version="1.0" encoding="UTF-8"?>

TENCompetence – IST-2005-027087 - 253
European Speaking Language Skills is an aggregation of Spoken Interaction Language Skill and Spoken Production Language Skill.
Example 4: Definition of the Europass Language Passport Language Skill

```xml
<?xml version="1.0" encoding="UTF-8"?>
<Competency xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="G:\CDM_CERTH.xsd">
  <Identifier>
    <Catalog>URL</Catalog>
    <Entry>http://culture2.coe.int/portfolio/documents/0521803136.txt.pdf</Entry>
  </Identifier>
  <Title>
    <langstring xml:lang="en">European Language Skills</langstring>
  </Title>
  <Description>
    <langstring xml:lang="en">European Language Skill consists of Understanding Level Language Skills, Speaking Level Language Skills and Writing Level Language Skills</langstring>
  </Description>
  <ProficiencyLevel>
    <Level Type="KnowledgeLevel">
      <Title>
        <langstring xml:lang="en">European Understanding Level Language Skills</langstring>
      </Title>
      <MinValue>A1</MinValue>
      <MaxValue>C2</MaxValue>
      <SuccessThreshold>3</SuccessThreshold>
      <States>
        <State>A1</State>
        <State>A2</State>
        <State>B1</State>
        <State>B2</State>
        <State>C1</State>
      </States>
    </Level>
  </ProficiencyLevel>
</Competency>
```
The Europass Mobility

Europass Mobility [37] is a standard document in use throughout Europe, which supports the detailed definition of the skills and competences acquired by an individual—of whatever age, educational level and occupational status—during a period of mobility in another European country. Europass Mobility aims to...
help holders to show better what they have gained through this experience, particularly in knowledge, skills and competences and encourage recognition of experiences gained abroad.

The Europass Mobility defines a competence ontology consisting of 7 simple competencies and 1 complex competency. Each of these simple competencies are associated with a list of topics depend on the host partner (see the figure below).
The below examples illustrate the definition of the skills and competences that must be acquired during the Europass Mobility experience with the use of CDM.
<?xml version="1.0" encoding="UTF-8"?>
<Competency xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="G:\CDM_CERTH.xsd">
  <Identifier>
    <Catalog>URL</Catalog>
    <Entry>http://www.europass.ie/europass/Publications/File,1148,en.pdf</Entry>
  </Identifier>
  <Title>
    <langstring xml:lang="en">Mobility Competences</langstring>
  </Title>
  <Description>
    <langstring xml:lang="en">Skills and competences acquired during the Europass Mobility Experience</langstring>
  </Description>
  <ProficiencyLevel>
    <Level Type="KnowledgeLevel">
      <Title>
        <langstring xml:lang="en">Activities/ tasks carried out during the Europass Mobility experience</langstring>
      </Title>
      <Description>
        <langstring xml:lang="en">Describe the activities/tasks carried out during the Europass Mobility experience</langstring>
      </Description>
      <Value>
        <NumericValue>
          <MinValue>1</MinValue>
          <MaxValue>10</MaxValue>
          <Interval>1</Interval>
          <SuccessThreshold>5</SuccessThreshold>
        </NumericValue>
      </Value>
    </Level>
    <Level Type="SkillLevel">
      <Title>
      </Title>
      <Description>
      </Description>
      <Value>
        <NumericValue>
        </NumericValue>
      </Value>
    </Level>
  </ProficiencyLevel>
</Competency>
<Title>
<langstring xml:lang="en">Job-related skills and competences</langstring>
</Title>
<Description>
<langstring xml:lang="en">Describe the technical or job-related skills and competences acquired, specifying the progress noted, the level of competence reached and, if relevant, assessment and/or tests carried out</langstring>
</Description>
<Value>
<NumericValue>
<MinValue>1</MinValue>
<MaxValue>10</MaxValue>
<Interval>1</Interval>
<SuccessThreshold>5</SuccessThreshold>
</NumericValue>
</Value>
</Level>
<Level Type="SkillLevel">
<Title>
<langstring xml:lang="en">Computer skills and competences</langstring>
</Title>
<Description>
<langstring xml:lang="en">Describe the computer skills and competences acquired, specifying progress made, level of competence reached and, if relevant, assessment and/or tests carried out</langstring>
</Description>
<Value>
<NumericValue>
<MinValue>1</MinValue>
<MaxValue>10</MaxValue>
<Interval>1</Interval>
<SuccessThreshold>5</SuccessThreshold>
</NumericValue>
</Value>
</Level>
<Level Type="SkillLevel">
  <Title>
    <langstring xml:lang="en">Organisational skills and competences</langstring>
  </Title>
  <Description>
    <langstring xml:lang="en">Describe the organisational skills and competences acquired, specifying progress made, level of competence reached and, if relevant, assessment and/or tests carried out</langstring>
  </Description>
  <Value>
    <NumericValue>
      <MinValue>1</MinValue>
      <MaxValue>10</MaxValue>
      <Interval>1</Interval>
      <SuccessThreshold>5</SuccessThreshold>
    </NumericValue>
  </Value>
</Level>

<Level Type="SkillLevel">
  <Title>
    <langstring xml:lang="en">Social skills and competences</langstring>
  </Title>
  <Description>
    <langstring xml:lang="en">Describe the social skills and competences acquired, specifying progress made, level of competence reached and, if relevant, assessment and/or tests carried out</langstring>
  </Description>
  <Value>
    <NumericValue>
      <MinValue>1</MinValue>
      <MaxValue>10</MaxValue>
      <Interval>1</Interval>
      <SuccessThreshold>5</SuccessThreshold>
    </NumericValue>
  </Value>
</Level>
<Level Type="SkillLevel">
  <Title>
    <langstring xml:lang="en">Other skills and competences</langstring>
  </Title>
  <Description>
    <langstring xml:lang="en">Describe the other skills and competences acquired, and not covered by above headings</langstring>
  </Description>
  <Value>
    <NumericValue>
      <MinValue>1</MinValue>
      <MaxValue>10</MaxValue>
      <Interval>1</Interval>
      <SuccessThreshold>5</SuccessThreshold>
    </NumericValue>
  </Value>
</Level>

<Level Type="SkillLevel">
  <Title>
    <langstring xml:lang="en">Language skills and competences</langstring>
  </Title>
  <Description>
    <langstring xml:lang="en">Describe the language skills and competences acquired, specifying if relevant the progression noted, the level of competence reached and, if relevant, assessment and/or tests carried out</langstring>
  </Description>
  <Value>
    <NumericValue>
      <MinValue>1</MinValue>
      <MaxValue>10</MaxValue>
      <Interval>1</Interval>
      <SuccessThreshold>5</SuccessThreshold>
    </NumericValue>
  </Value>
</Level>
The Europass CV

The Europass CV [37] illustrates skills and qualifications acquired by an individual in a clear and easily understandable document. The information is presented in a standard European format, which will increase recognition and transparency of the document across Europe.

The Europass CV defines a competence ontology consisting of 6 simple competencies and 3 complex competencies. The Complex competency “Other Language” consists of other competencies, correspondingly to Europass Language Passport Taxonomy (see also Fig. 2). The rest simple competencies are associated with a list of topics depend on the competencies of the individual (see the figure below).
Figure 52: Partial View of Competence Ontology used in Europass CV

<?xml version="1.0" encoding="UTF-8"?>
<Competency xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="G:\CDM_CERTH.xsd">
  <Identifier>
    <Catalog>URL</Catalog>
  </Identifier>
</Competency>
<Entry>http://www.europass.ie/europass/Publications/File,1148,en.pdf</Entry>
<Title>
<langstring xml:lang="en">CV Competences</langstring>
</Title>
<Description>
<langstring xml:lang="en">Skills and competences acquired in the course of life and career but not necessarily covered by formal certificates and diplomas</langstring>
</Description>
<ProficiencyLevel>
<Level Type="KnowledgeLevel">
<Title>
<langstring xml:lang="en">Personal skills and competences</langstring>
</Title>
<Description>
<langstring xml:lang="en">Social skills and competences refer to skills and competences acquired both in the course of your education and training (during your studies) during seminars or continuing training sessions, and in a non-formal manner (in the course of your occupational or leisure activities)</langstring>
</Description>
<Value>
<NumericValue>
<MinValue>1</MinValue>
<MaxValue>10</MaxValue>
<Interval>1</Interval>
<SuccessThreshold>5</SuccessThreshold>
</NumericValue>
</Value>
</Level>
<Level Type="KnowledgeLevel">
<Title>
<langstring xml:lang="en">Organisational skills and competences</langstring>
</Title>
</Level>
</ProficiencyLevel>
Organisational skills and competences refer to coordination and administration of people, projects and budgets, at work, in voluntary work (for example culture and sports) and at home, etc.

Technical skills and competences refer to mastery of specific kinds of equipment, machinery, etc. other than computers, or to technical skills and competences in a specialised field (manufacturing industry, health, banking, etc.).
<Title><langstring xml:lang="en">Computer skills and competences</langstring></Title>

<Description>
  <langstring xml:lang="en">Computer skills and competences refer to word processing and other applications, database searching, acquaintance with Internet, advanced skills (programming etc.).</langstring>
</Description>

<Value>
  <NumericValue>
    <MinValue>1</MinValue>
    <MaxValue>10</MaxValue>
    <Interval>1</Interval>
    <SuccessThreshold>5</SuccessThreshold>
  </NumericValue>
</Value>

<Level Type="KnowledgeLevel">
  <Title>
    <langstring xml:lang="en">Artistic skills and competences</langstring>
  </Title>
  <Description>
    <langstring xml:lang="en">State here your artistic skills and competences which are an asset (music; writing; design, etc.). Specify in what context they were acquired (through training, work, seminars, voluntary or leisure activities, etc.).</langstring>
  </Description>
  <Value>
    <NumericValue>
      <MinValue>1</MinValue>
      <MaxValue>10</MaxValue>
      <Interval>1</Interval>
      <SuccessThreshold>5</SuccessThreshold>
    </NumericValue>
  </Value>
</Level>
### Other skills and competences

State here any other skill(s) and competence(s) which are an asset and are not mentioned under earlier headings (hobbies; sports, positions of responsibility in voluntary organisations).

<table>
<thead>
<tr>
<th>Level Type</th>
<th>KnowledgeLevel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td></td>
</tr>
<tr>
<td>langstring xml:lang</td>
<td>&quot;en&quot;</td>
</tr>
<tr>
<td>Title</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>langstring xml:lang</td>
<td>&quot;en&quot;</td>
</tr>
<tr>
<td>Value</td>
<td></td>
</tr>
<tr>
<td>&lt;MinValue&gt;</td>
<td>1</td>
</tr>
<tr>
<td>&lt;MaxValue&gt;</td>
<td>10</td>
</tr>
<tr>
<td>&lt;Interval&gt;</td>
<td>1</td>
</tr>
<tr>
<td>&lt;SuccessThreshold&gt;</td>
<td>5</td>
</tr>
</tbody>
</table>

**Figure 53:** Describing the “CV Competencies” of the Europass CV using CDM
## Appendix G: Detail Description of the Anonymous User Use Cases

### The Description of Use Case – Login

<table>
<thead>
<tr>
<th>Description</th>
<th>Login</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>The Use Case “Log-in” allows the anonymous user to be authenticated by the system and get access to the functionalities of the system. If the username belongs to an individual or to representative from an Enterprise or an Organization the user obtain the role of a registered user. Otherwise if the username corresponds to the administrator the user obtain the role of the administrator of the system</td>
</tr>
<tr>
<td><strong>Actors</strong></td>
<td>Anonymous User.</td>
</tr>
</tbody>
</table>
| **Basic Flow** | The user gets into the system and focus on the Login area.  
The user fills in the form.  
The system verifies the username and the password.  
The system authenticates the user and assigns him a role.  
The system shows the next screen according to the user’s rights. |
| **Alternative Flows** | Wrong username and password. |
| **Pre-Conditions** | None |
| **Post-Conditions** | The user is authenticated from the system.  
If the access to the system fails, then the user considered as unauthenticated. |
### Table 6: Description of Use Case - Log-in

<table>
<thead>
<tr>
<th>Login</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extends</td>
</tr>
<tr>
<td>Includes</td>
</tr>
<tr>
<td>Specific Requirements</td>
</tr>
<tr>
<td>Notes</td>
</tr>
</tbody>
</table>

#### The Description of Use Case – Fill Registration Form

<table>
<thead>
<tr>
<th>Fill Registration Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
</tr>
<tr>
<td>Actors</td>
</tr>
<tr>
<td>Basic Flow</td>
</tr>
<tr>
<td>Alternative Flows</td>
</tr>
<tr>
<td>Pre-Conditions</td>
</tr>
<tr>
<td>Post-Conditions</td>
</tr>
<tr>
<td>Extends</td>
</tr>
</tbody>
</table>
### The Description of Use Case – View News

<table>
<thead>
<tr>
<th>Description</th>
<th>A user can get into the observatory and view news about the observatory.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actors</td>
<td>Anonymous User.</td>
</tr>
<tr>
<td><strong>Basic Flow</strong></td>
<td>The user gets into the system and presses the News Hyperlink from the menu.</td>
</tr>
<tr>
<td></td>
<td>The system shows him a list with the latest news.</td>
</tr>
<tr>
<td></td>
<td>The user chooses the title of the topic that he is interested to.</td>
</tr>
<tr>
<td></td>
<td>The system shows him additional information about this topic.</td>
</tr>
<tr>
<td><strong>Alternative Flows</strong></td>
<td>The system doesn’t show to the user a list with news because there aren’t any.</td>
</tr>
<tr>
<td>Pre-Conditions</td>
<td>None</td>
</tr>
<tr>
<td>Post-Conditions</td>
<td>The user is viewing additional information about the latest news of the observatory.</td>
</tr>
<tr>
<td>Extends</td>
<td>None</td>
</tr>
<tr>
<td>Includes</td>
<td>None</td>
</tr>
<tr>
<td>Specific Requirements</td>
<td>None</td>
</tr>
<tr>
<td>Notes</td>
<td>None</td>
</tr>
</tbody>
</table>

Table 7: Description of Use Case - Fill Registration Form
### Table 8: Description of Use Case – View News

<table>
<thead>
<tr>
<th><strong>The Description of Use Case – Search Observatory Contents</strong></th>
<th><strong>Search Observatory Contents</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>A user can get in the observatory and search into the records of the observatory’s database.</td>
</tr>
<tr>
<td><strong>Actors</strong></td>
<td>Anonymous User.</td>
</tr>
<tr>
<td><strong>Basic Flow</strong></td>
<td>The system shows the screen with the appropriate search conditions.</td>
</tr>
<tr>
<td></td>
<td>The user inserts his key-words into the optional blank fields.</td>
</tr>
<tr>
<td></td>
<td>The system allocates the records from the database that match with the search criteria and shows the results to the user.</td>
</tr>
<tr>
<td><strong>Alternative Flows</strong></td>
<td>The system shows a screen to the user that informs him that were no such results found that accomplish his search criteria.</td>
</tr>
<tr>
<td><strong>Pre-Conditions</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Post-Conditions</strong></td>
<td>The user sees a title that is linked with a Hyperlink that leads to additional information.</td>
</tr>
<tr>
<td><strong>Extends</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Includes</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Specific Requirements</strong></td>
<td>The search results must be classified by name or by date</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>None</td>
</tr>
</tbody>
</table>

### Table 9: Description of Use Case – Search Observatory Contents

| **The Description of Use Case – View available jobs/functions** | **View available jobs/functions** |
### View available jobs/functions

<table>
<thead>
<tr>
<th>Description</th>
<th>An anonymous user can get into the system and view the available jobs/functions of the observatory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actors</td>
<td>Registered User</td>
</tr>
</tbody>
</table>
| **Basic Flow** | The system shows the screen with the appropriate search conditions.  
The user inserts his key-words into the optional blank fields.  
The system allocates the records from the database that match with the search criteria and shows the results to the user. |
| **Alternative Flows** | The system shows a screen to the user that informs him that were no such results found that accomplish his search criteria. |
| **Pre-Conditions** | None                                                                                      |
| **Post-Conditions** | The user is viewing the selected jobs/functions                                                                 |
| **Extends** | None                                                                                       |
| **Includes** | None                                                                                      |
| **Specific Requirements** | The search results must be classified by date of insertion of the job/function to the system or by name |
| **Notes** | None                                                                                       |

#### Table 10: Description of Use Case - View available jobs/functions

### View available Competences

<table>
<thead>
<tr>
<th>Description</th>
<th>An anonymous user can get into the system and access the competences repository</th>
</tr>
</thead>
</table>
### View available Competences

<table>
<thead>
<tr>
<th>Actors</th>
<th>Registered User.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic Flow</strong></td>
<td>The system shows the screen with the appropriate search conditions. The user inserts his key-words into the optional blank fields. The system allocates the records from the database that match with the search criteria and shows the results to the user.</td>
</tr>
<tr>
<td><strong>Alternative Flows</strong></td>
<td>The system shows a screen to the user that informs him that were no such results found that accomplish his search criteria.</td>
</tr>
<tr>
<td><strong>Pre-Conditions</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Post-Conditions</strong></td>
<td>The user is viewing the selected competences</td>
</tr>
<tr>
<td><strong>Extends</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Includes</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Specific Requirements</strong></td>
<td>The search results must be classified by date of insertion of the competency to the system or by name</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>None</td>
</tr>
</tbody>
</table>

**Table 11:** Description of Use Case - View available Competences

### The Description of Use Case – View Links

<table>
<thead>
<tr>
<th><strong>Use Case Description – View Links</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Actors</strong></td>
</tr>
</tbody>
</table>
## Use Case Description – View Links

<table>
<thead>
<tr>
<th>Use Case Description – View Links</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic Flow</strong></td>
<td>A user can get into the observatory and view resources (documents, presentations, etc.) related with the observatory.</td>
</tr>
<tr>
<td><strong>Pre-Conditions</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Post-Conditions</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Extends</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Includes</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Specific Requirements</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>None</td>
</tr>
</tbody>
</table>

### Table 12: Description of Use Case – View Links

<table>
<thead>
<tr>
<th>Description</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actors</td>
<td>Anonymous User</td>
</tr>
</tbody>
</table>
Use Case Description – View Resources

<table>
<thead>
<tr>
<th>Basic Flow</th>
<th>The user gets into the system and presses the Resources Hyperlink from the menu. The system shows him a list of Resources. The user chooses a specific resource and downloads it</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative Flows</td>
<td>The system doesn’t show to the user a list with resources because there aren’t any.</td>
</tr>
<tr>
<td>Pre-Conditions</td>
<td>None</td>
</tr>
<tr>
<td>Post-Conditions</td>
<td>The user downloads the resource</td>
</tr>
<tr>
<td>Extends</td>
<td>None</td>
</tr>
<tr>
<td>Includes</td>
<td>None</td>
</tr>
<tr>
<td>Specific Requirements</td>
<td>None</td>
</tr>
<tr>
<td>Notes</td>
<td>None</td>
</tr>
</tbody>
</table>

Table 13: Description of Use Case – View Resources

Appendix H: Detail Description of the Registered User Use Cases

The Description of Use Case – View News

<table>
<thead>
<tr>
<th>Use Case Description – View News</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
</tr>
</tbody>
</table>
Use Case Description – View News

<table>
<thead>
<tr>
<th>Actors</th>
<th>Registered User.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic Flow</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The user gets into the system and presses the News Hyperlink from the menu.</td>
</tr>
<tr>
<td></td>
<td>The system shows him a list with the latest news.</td>
</tr>
<tr>
<td></td>
<td>The user chooses the title of the topic that he is interested to.</td>
</tr>
<tr>
<td></td>
<td>The system shows him additional information about this topic.</td>
</tr>
<tr>
<td><strong>Alternative Flows</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The system doesn’t show to the user a list with news because there isn’t any.</td>
</tr>
<tr>
<td><strong>Pre-Conditions</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Post-Conditions</strong></td>
<td>The user is viewing additional information about the latest news of the observatory.</td>
</tr>
<tr>
<td><strong>Extends</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Includes</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Specific Requirements</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>None</td>
</tr>
</tbody>
</table>

Table 14: Description of Use Case – View News

The Description of Use Case – View Links

<table>
<thead>
<tr>
<th>Use Case Description – View Links</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Actors</strong></td>
</tr>
</tbody>
</table>
### Use Case Description – View Links

<table>
<thead>
<tr>
<th>Basic Flow</th>
<th>The user gets into the system and presses the Links Hyperlink from the menu. The system shows him a list of links. The user chooses a link and the a web page appears in a new window</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative Flows</td>
<td>The system doesn’t show to the user a list with links because there aren’t any.</td>
</tr>
<tr>
<td>Pre-Conditions</td>
<td>None</td>
</tr>
<tr>
<td>Post-Conditions</td>
<td>The user is viewing a new web page related with the observatory or with the domain of the observatory</td>
</tr>
<tr>
<td>Extends</td>
<td>None</td>
</tr>
<tr>
<td>Includes</td>
<td>None</td>
</tr>
<tr>
<td>Specific Requirements</td>
<td>None</td>
</tr>
<tr>
<td>Notes</td>
<td>None</td>
</tr>
</tbody>
</table>

*Table 15: Description of Use Case – View Links*

### The Description of Use Case – View Resources

<table>
<thead>
<tr>
<th>Description</th>
<th>A user can get into the observatory and view resources (documents, presentations, etc) related with the observatory and with the observatory domain.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actors</td>
<td>Registered User.</td>
</tr>
</tbody>
</table>
Use Case Description – View Resources

Basic Flow
The user gets into the system and presses the Resources Hyperlink from the menu.
The system shows him a list of Resources.
The user chooses a specific resource and downloads it.

Alternative Flows
The system doesn’t show to the user a list with resources because there aren’t any.

Pre-Conditions
None

Post-Conditions
The user downloads the resource

Extends
None

Includes
None

Specific Requirements
None

Notes
None

Table 16: Description of Use Case – View Resources

The Description of Use Case – Search Observatory Contents

Search Observatory Contents

Description
A user can get in the observatory and search into the records of the observatory’s database.

Actors
Registered User.
### Search Observatory Contents

<table>
<thead>
<tr>
<th><strong>Basic Flow</strong></th>
<th>The system shows the screen with the appropriate search conditions. The user inserts his key-words into the optional blank fields. The system allocates the records from the database that match with the search criteria and shows the results to the user.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alternative Flows</strong></td>
<td>The system shows a screen to the user that informs him that were no such results found that accomplish his search criteria.</td>
</tr>
<tr>
<td><strong>Pre-Conditions</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Post-Conditions</strong></td>
<td>The user sees a title that is linked with a Hyperlink that leads to additional information.</td>
</tr>
<tr>
<td><strong>Extends</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Includes</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Specific Requirements</strong></td>
<td>The search results must be classified by name or by date</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>None</td>
</tr>
</tbody>
</table>

**Table 17:** Description of Use Case – Search Observatory Contents

---

### The Description of Use Case – Manage User Profile

#### Edit User Profile

<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th>A registered user can enter into the observatory and manage his profile</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Actors</strong></td>
<td>Registered User.</td>
</tr>
</tbody>
</table>
### Edit User Profile

| Basic Flow | The user gets into the system and presses the User Profile Hyperlink from the menu.  
The system shows him the available options, in order to manage his profile |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative Flows</td>
<td>None.</td>
</tr>
<tr>
<td>Pre-Conditions</td>
<td>The user is authenticated from the system</td>
</tr>
<tr>
<td>Post-Conditions</td>
<td>None</td>
</tr>
<tr>
<td>Extends</td>
<td>None</td>
</tr>
<tr>
<td>Includes</td>
<td>Edit User Profile, View User Profile</td>
</tr>
<tr>
<td>Specific Requirements</td>
<td>None</td>
</tr>
<tr>
<td>Notes</td>
<td>None</td>
</tr>
</tbody>
</table>

**Table 18: Description of Use - Manage User Profile**

**The Description of Use Case – Edit User Profile**

<table>
<thead>
<tr>
<th><strong>Edit User Profile</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Actors</strong></td>
</tr>
</tbody>
</table>
| **Basic Flow** | The user gets into the system and presses the User Profile Hyperlink from the menu.  
The system shows him the details of the profile  
The user changes the fields that he wants to update and submit the changes. |
### Edit User Profile

<table>
<thead>
<tr>
<th>Alternative Flows</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>The user did not fill all the fields that were required or put invalid values to some fields. The system shows him again the profile details and informs him with a message about the fields he did not fill right.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-Conditions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>The user is authenticated from the system</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Post-Conditions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>The user updates his profile</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Extends</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Includes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specific Requirements</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Notes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

### Table 19: Description of Use - Edit User Profile

### The Description of Use Case – View User Profile

<table>
<thead>
<tr>
<th>View User Profile</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A registered user can get in the observatory and view his profile</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actors</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registered User.</td>
<td></td>
</tr>
</tbody>
</table>
### View User Profile

| Basic Flow | The user gets into the system and presses the View User Profile Hyperlink from the menu.  
|            | The system shows him the details of the profile |
| Pre-Conditions | The user is authenticated from the system |
|Post-Conditions | The user views his profile |
| Extends | None |
| Includes | None |
| Specific Requirements | None |
| Notes | None |

**Table 20:** Description of Use - View User Profile

### The Description of Use Case – View available jobs/functions

<table>
<thead>
<tr>
<th>View available jobs/functions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Actors</strong></td>
</tr>
</tbody>
</table>
| **Basic Flow** | The system shows the screen with the appropriate search conditions.  
| | The user inserts his key-words into the optional blank fields.  
<p>| | The system allocates the records from the database that match with the |</p>
<table>
<thead>
<tr>
<th>View available jobs/functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>search criteria and shows the results to the user.</td>
</tr>
</tbody>
</table>

**Alternative Flows**
- The system shows a screen to the user that informs him that were no such results found that accomplish his search criteria.

**Pre-Conditions**
- The user is authenticated from the system

**Post-Conditions**
- The user is viewing the selected jobs/functions

**Extends**
- None

**Includes**
- None

**Specific Requirements**
- The search results must be classified by the name of the job/function

**Notes**
- None

---

**Table 21: Description of Use Case - View available jobs/functions**

**The Description of Use Case – Copy Competences of a job/function to my space**

<table>
<thead>
<tr>
<th>Copy Competences of a job/function to my space</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>A registered user can get into the system find a specific job/function, and copy the list of competences for that job/function to his space</td>
</tr>
<tr>
<td><strong>Actors</strong></td>
</tr>
<tr>
<td>Registered User.</td>
</tr>
<tr>
<td><strong>Basic Flow</strong></td>
</tr>
<tr>
<td>The user gets into the system and presses the View Jobs/Functions hyperlink from the menu</td>
</tr>
<tr>
<td>The system shows a list with the available jobs/functions</td>
</tr>
<tr>
<td><strong>Copy Competences of a job/function to my space</strong></td>
</tr>
<tr>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>The user chooses a specific job/function</td>
</tr>
<tr>
<td>The user presses the View List of Competences hyperlink</td>
</tr>
<tr>
<td>The user chooses the competences that he want to copy to his space</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Alternative Flows</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The user presses the Search Job/Function hyperlink</td>
</tr>
<tr>
<td>The system shows the screen with the appropriate search conditions.</td>
</tr>
<tr>
<td>The user inserts his key-words into the optional blank fields.</td>
</tr>
<tr>
<td>The system allocates the records from the database that match with the search criteria and shows the results to the user.</td>
</tr>
<tr>
<td>The system shows a list with the available jobs/functions based on the search criteria</td>
</tr>
<tr>
<td>The user chooses a specific job/function</td>
</tr>
<tr>
<td>The user presses the View List of Competences hyperlink</td>
</tr>
<tr>
<td>The user chooses the competences that he want to copy to his space</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Pre-Conditions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The user is authenticated from the system</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Post-Conditions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The user copies the selected competences to his space</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Extends</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Includes</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>View available Jobs/Functions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Specific Requirements</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Notes</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
</tr>
</tbody>
</table>

**Table 22:** Description of Use Case - Copy Competences of a job/function to my space
### The Description of Use Case – Connect to Community of specific job/function

<table>
<thead>
<tr>
<th>Description</th>
<th>A registered user can get into the system find a specific job/function and connect to the Community of specific job/function, in order to participate to the collaboration tools of the community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actors</td>
<td>Registered User.</td>
</tr>
</tbody>
</table>
| Basic Flow  | The user gets into the system and presses the View Jobs/Functions hyperlink from the menu  
The system shows a list with the available jobs/functions  
The user chooses a specific job/function and presses the Connect to Community hyperlink |

### Alternative Flows

<table>
<thead>
<tr>
<th>Pre-Conditions</th>
<th>The user is authenticated from the system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Conditions</td>
<td>The user connected to the selected community</td>
</tr>
<tr>
<td>Extends</td>
<td>None</td>
</tr>
<tr>
<td>Includes</td>
<td>View available Jobs/Functions</td>
</tr>
</tbody>
</table>

TEN Competence – IST-2005-027087 - 288
### Connect to Community of specific job/function

<table>
<thead>
<tr>
<th>Specific Requirements</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes</td>
<td>None</td>
</tr>
</tbody>
</table>

**Table 23:** Description of Use Case - Connect to Community of specific job/function

The Description of Use Case – Participate Forum

<table>
<thead>
<tr>
<th>Participate Forum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>A user can get into the system connect to a community of a specific job/function and participate with online discussion groups, where participants with common interests can exchange open messages.</td>
</tr>
<tr>
<td><strong>Actors</strong></td>
</tr>
<tr>
<td>Registered User.</td>
</tr>
<tr>
<td><strong>Basic Flow</strong></td>
</tr>
<tr>
<td>The user gets into the system and presses the View Jobs/Functions hyperlink from the menu</td>
</tr>
<tr>
<td>The system shows a list with the available jobs/functions</td>
</tr>
<tr>
<td>The user chooses a specific job/function and presses the Connect to Community hyperlink</td>
</tr>
<tr>
<td>The user selects the Forum Hyperlink from the menu.</td>
</tr>
<tr>
<td>The system shows him a screen with the topics.</td>
</tr>
<tr>
<td>The user chooses the topic that he wants to participate.</td>
</tr>
<tr>
<td><strong>Alternative Flows</strong></td>
</tr>
<tr>
<td>The user presses the Search Job/Function hyperlink</td>
</tr>
<tr>
<td>The system shows the screen with the appropriate search conditions.</td>
</tr>
<tr>
<td>The user inserts his key-words into the optional blank fields.</td>
</tr>
<tr>
<td>The system allocates the records from the database that match with the search</td>
</tr>
</tbody>
</table>
### Participate Forum

<table>
<thead>
<tr>
<th>Description</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>criteria and shows the results to the user.</td>
<td></td>
</tr>
<tr>
<td>The system shows a list with the available jobs/functions based on the search</td>
<td></td>
</tr>
<tr>
<td>criteria</td>
<td></td>
</tr>
<tr>
<td>The user chooses a specific job/function and presses the Connect to Community</td>
<td></td>
</tr>
<tr>
<td>hyperlink</td>
<td></td>
</tr>
<tr>
<td>The user selects the Forum Hyperlink from the menu.</td>
<td></td>
</tr>
<tr>
<td>The system shows him a screen with the topics.</td>
<td></td>
</tr>
<tr>
<td>The user chooses the topic that he wants to participate</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-Conditions</th>
<th>The user is authenticated from the system.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Conditions</td>
<td>The user participates to the forum.</td>
</tr>
<tr>
<td>Extends</td>
<td>None</td>
</tr>
<tr>
<td>Includes</td>
<td>Connect to Community of specific job/function</td>
</tr>
<tr>
<td>Specific Requirements</td>
<td>None</td>
</tr>
<tr>
<td>Notes</td>
<td>None</td>
</tr>
</tbody>
</table>

**Table 24: Description of Use Case – Participate Forum**

### The Description of Use Case – Participate Chat

<table>
<thead>
<tr>
<th>Description</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A user can get into the system connect to a community of a specific job/function and have real-time communication with other users over the observatory.</td>
<td></td>
</tr>
<tr>
<td>Actors</td>
<td>Registered User.</td>
</tr>
</tbody>
</table>
## Participate Chat

<table>
<thead>
<tr>
<th>Basic Flow</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The user gets into the system and presses the View Jobs/Functions hyperlink from the menu</td>
<td>The system shows a list with the available jobs/functions</td>
</tr>
<tr>
<td>The user chooses a specific job/function and presses the Connect to Community hyperlink</td>
<td>The user selects the Chat Hyperlink from the menu.</td>
</tr>
<tr>
<td>The system prompts him to fill in a username.</td>
<td>The system shows him the chat’s basic screen.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alternative Flows</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The user presses the Search Job/Function hyperlink</td>
<td>The system shows the screen with the appropriate search conditions.</td>
</tr>
<tr>
<td>The system shows the screen with the appropriate search conditions.</td>
<td>The user inserts his key-words into the optional blank fields.</td>
</tr>
<tr>
<td>The system allocates the records from the database that match with the search criteria and shows the results to the user.</td>
<td>The system shows a list with the available jobs/functions based on the search criteria</td>
</tr>
<tr>
<td>The user chooses a specific job/function and presses the Connect to Community hyperlink</td>
<td>The user selects the Chat Hyperlink from the menu.</td>
</tr>
<tr>
<td>The system prompts him to fill in a username.</td>
<td>The system shows him the chat’s basic screen.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-Conditions</th>
<th>The user is authenticated from the system.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Conditions</td>
<td>The user participates to the chat.</td>
</tr>
<tr>
<td>Participate Chat</td>
<td>Participate Wiki</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Extends</td>
<td>None</td>
</tr>
</tbody>
</table>
Participate Wiki

The system shows the screen with the appropriate search conditions.
The user inserts his key-words into the optional blank fields.
The system allocates the records from the database that match with the search criteria and shows the results to the user.
The system shows a list with the available jobs/functions based on the search criteria.
The user chooses a specific job/function and presses the Connect to Community hyperlink.
The user selects the Wiki Hyperlink from the menu.
The system shows to users the Wiki’s basic screen.
The system allows to users to add content, as on an Internet forum, but also allows anyone to edit the content.

Pre-Conditions
The user is authenticated from the system.

Post-Conditions
The user participates to the Wiki.

Extends
None

Includes
Connect to Community of specific job/function

Specific Requirements
None

Notes
None

Table 26: Description of Use Case – Participate Wiki

The Description of Use Case – View Community Members

TENCompetence – IST-2005-027087 - 293
### View Community Members

<table>
<thead>
<tr>
<th>Description</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A user can get into the system connect to a community of a specific job/function and view the</td>
<td>profiles of the members of the community</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actors</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Registered User.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Basic Flow</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The user gets into the system and presses the View Jobs/Functions hyperlink from the menu</td>
<td></td>
</tr>
<tr>
<td>The system shows a list with the available jobs/functions</td>
<td></td>
</tr>
<tr>
<td>The user chooses a specific job/function and presses the Connect to Community hyperlink</td>
<td></td>
</tr>
<tr>
<td>The user selects the View Community Members hyperlink from the menu.</td>
<td></td>
</tr>
<tr>
<td>The system shows to members of the community.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alternative Flows</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The user presses the Search Job/Function hyperlink.</td>
<td></td>
</tr>
<tr>
<td>The system shows the screen with the appropriate search conditions.</td>
<td></td>
</tr>
<tr>
<td>The user inserts his key-words into the optional blank fields.</td>
<td></td>
</tr>
<tr>
<td>The system allocates the records from the database that match with the search criteria and</td>
<td>shows the results to the user.</td>
</tr>
<tr>
<td>The system shows a list with the available jobs/functions based on the search criteria</td>
<td></td>
</tr>
<tr>
<td>The user chooses a specific job/function and presses the Connect to Community hyperlink</td>
<td></td>
</tr>
<tr>
<td>The user selects the View Community Members hyperlink from the menu.</td>
<td></td>
</tr>
<tr>
<td>The system shows to members of the community.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-Conditions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The user is authenticated from the system.</td>
<td></td>
</tr>
</tbody>
</table>
### View Community Members

<table>
<thead>
<tr>
<th>Post-Conditions</th>
<th>The user is viewing the community members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extends</td>
<td>None</td>
</tr>
<tr>
<td>Includes</td>
<td>Connect to Community of specific job/function</td>
</tr>
<tr>
<td>Specific Requirements</td>
<td>None</td>
</tr>
<tr>
<td>Notes</td>
<td>None</td>
</tr>
</tbody>
</table>

**Table 27: Description of Use Case – View Community Members**

**The Description of Use Case – View list of Competences for a job/function**

<table>
<thead>
<tr>
<th>View list of Competences for a job/function</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>A registered user can get into the system find a specific job/function and view the list of competences.</td>
</tr>
<tr>
<td><strong>Actors</strong></td>
</tr>
<tr>
<td>Registered User.</td>
</tr>
<tr>
<td><strong>Basic Flow</strong></td>
</tr>
<tr>
<td>The user gets into the system and presses the View Jobs/Functions hyperlink from the menu</td>
</tr>
<tr>
<td>The system shows a list with the available jobs/functions</td>
</tr>
<tr>
<td>The user chooses a specific job/function</td>
</tr>
<tr>
<td>The user presses the View List of Competencies hyperlink</td>
</tr>
<tr>
<td>The system shows a list with the available competences related with that job/function</td>
</tr>
<tr>
<td><strong>Alternative Flows</strong></td>
</tr>
<tr>
<td>The user presses the Search Job/Function hyperlink</td>
</tr>
<tr>
<td>The system shows the screen with the appropriate search conditions.</td>
</tr>
</tbody>
</table>
### View list of Competences for a job/function

<table>
<thead>
<tr>
<th>Pre-Conditions</th>
<th>The user is authenticated from the system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Conditions</td>
<td>The user is viewing the list with the available competences</td>
</tr>
<tr>
<td>Extends</td>
<td>None</td>
</tr>
<tr>
<td>Includes</td>
<td>View available Jobs/Functions</td>
</tr>
<tr>
<td>Specific Requirements</td>
<td>None</td>
</tr>
<tr>
<td>Notes</td>
<td>None</td>
</tr>
</tbody>
</table>

**Table 28: Description of Use Case – View list of Competences for a job/function**

### The Description of Use Case – Manage my Competences

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A registered user can get into the system and manage his competences by doing specific actions</td>
</tr>
</tbody>
</table>
### Manage my Competences

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Actors</strong></td>
<td>Registered User.</td>
</tr>
</tbody>
</table>
| **Basic Flow** | The user gets into the system and presses the My Competences hyperlink from the menu  
The system shows him specific actions for managing his competences |
| **Alternative Flows** | None                                                   |
| **Pre-Conditions** | The user is authenticated from the system              |
| **Post-Conditions** | None                                                   |
| **Extends**    | Edit Competence, Delete Competence, Extract Competences to XML |
| **Includes**   | None                                                   |
| **Specific Requirements** | None                                                   |
| **Notes**      | None                                                   |

Table 29: Description of Use Case – Manage my Competences

### The Description of Use Case – Edit Competence

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>A registered user can get into the system and edit the competences, which has in his space</td>
</tr>
<tr>
<td><strong>Actors</strong></td>
<td>Registered User.</td>
</tr>
</tbody>
</table>
| **Basic Flow** | The user gets into the system and presses the Manage My Competences hyperlink from the menu.  
The system shows a list with the available Competences  
The user selects the competence that he wants to edit  
The system shows a form with the competence elements  
The user changes the desired fields and submit the changes |
| --- | --- |
| **Alternative Flows** | The user presses the Search My Competences hyperlink  
The system shows the screen with the appropriate search conditions.  
The user inserts his key-words into the optional blank fields.  
The system allocates the records from the database that match with the search criteria and shows the results to the user.  
The system shows a list with the available competences based on the search criteria  
The user selects the competence that he wants to edit  
The system shows a form with the competence elements  
The user changes the desired fields and submit the changes |
<p>| <strong>Pre-Conditions</strong> | The user is authenticated from the system |
| <strong>Post-Conditions</strong> | The user creates a new version of the competence |
| <strong>Extends</strong> | None |
| <strong>Includes</strong> | None |
| <strong>Specific</strong> | None |</p>
<table>
<thead>
<tr>
<th>Requirements</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes</td>
<td>None</td>
</tr>
</tbody>
</table>

Table 30: Description of Use Case – Edit Competence

**The Description of Use Case – Extract Competence to XML**

<table>
<thead>
<tr>
<th>Extract Competence to XML</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Actors</strong></td>
</tr>
<tr>
<td><strong>Basic Flow</strong></td>
</tr>
</tbody>
</table>
| **Alternative Flows** | The user presses the Search My Competences hyperlink. The system shows the screen with the appropriate search conditions. The user inserts his key-words into the optional blank fields. The system allocates the records from the database that match with the search criteria and shows the results to the user. The system shows a list with the available competences based on the search.
### Extract Competence to XML

<table>
<thead>
<tr>
<th>Criteria</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The user selects the competence that he wants to extract and presses the Extract to XML hyperlink</td>
<td></td>
</tr>
<tr>
<td>The system creates a XML file</td>
<td></td>
</tr>
<tr>
<td>The user downloads the XML file</td>
<td></td>
</tr>
<tr>
<td><strong>Pre-Conditions</strong></td>
<td></td>
</tr>
<tr>
<td>The user is authenticated from the system</td>
<td></td>
</tr>
<tr>
<td><strong>Post-Conditions</strong></td>
<td></td>
</tr>
<tr>
<td>The user extracts the competence to XML format</td>
<td></td>
</tr>
<tr>
<td><strong>Extends</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Includes</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Specific Requirements</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>None</td>
</tr>
</tbody>
</table>

**Table 31:** Description of Use Case – Extract Competence to XML

### The Description of Use Case – Delete Competence

<table>
<thead>
<tr>
<th>Description</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A registered user can get into the system delete competences from his space</td>
<td></td>
</tr>
<tr>
<td><strong>Actors</strong></td>
<td>Registered User.</td>
</tr>
<tr>
<td><strong>Basic Flow</strong></td>
<td>The user gets into the system and presses the View My Competences hyperlink from the menu</td>
</tr>
<tr>
<td></td>
<td>The system shows a list with the available Competences</td>
</tr>
</tbody>
</table>
### Delete Competence

<table>
<thead>
<tr>
<th>Alternative Flows</th>
<th>Delete Competence</th>
</tr>
</thead>
<tbody>
<tr>
<td>The user selects the competence that he wants delete</td>
<td></td>
</tr>
<tr>
<td>The system deletes the competence from the user’s space</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-Conditions</th>
<th>The user is authenticated from the system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Conditions</td>
<td>The user deletes the competence from his space</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Extends</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Includes</td>
<td>None</td>
</tr>
<tr>
<td>Specific Requirements</td>
<td>None</td>
</tr>
<tr>
<td>Notes</td>
<td>None</td>
</tr>
</tbody>
</table>

**Table 32:** Description of Use Case – Delete Competence

The Description of Use Case – Manage Competences Repository
### Manage Competences Repository

<table>
<thead>
<tr>
<th>Description</th>
<th>A registered user can get into the system and manage the Competences Repository</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actors</td>
<td>Registered User.</td>
</tr>
<tr>
<td>Basic Flow</td>
<td>The user gets into the system and presses the Competences Repository hyperlink from the menu. The system shows a list with actions for managing the Competences Repository</td>
</tr>
<tr>
<td>Alternative Flows</td>
<td>None</td>
</tr>
<tr>
<td>Pre-Conditions</td>
<td>The user is authenticated from the system</td>
</tr>
<tr>
<td>Post-Conditions</td>
<td>None</td>
</tr>
<tr>
<td>Extends</td>
<td>None</td>
</tr>
<tr>
<td>Includes</td>
<td>Create Competence</td>
</tr>
<tr>
<td>Specific Requirements</td>
<td>None</td>
</tr>
<tr>
<td>Notes</td>
<td>None</td>
</tr>
</tbody>
</table>

**Table 33: Description of Use Case – Manage Competences Repository**

### Description of Use Case – Create Competence

<table>
<thead>
<tr>
<th>Description</th>
<th>A registered user can get into the system and add a new competency for a job/function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actors</td>
<td>Registered User.</td>
</tr>
</tbody>
</table>
Create competence

<table>
<thead>
<tr>
<th>Basic Flow</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The user gets into the system and presses the Add New Competency hyperlink from the menu</td>
<td></td>
</tr>
<tr>
<td>The system shows a form with the competency details that the user must fill</td>
<td></td>
</tr>
<tr>
<td>The user submits the filled form</td>
<td></td>
</tr>
<tr>
<td>The system informs the user if the submission was successful</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alternative Flows</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The user did not fill all the fields that were required.</td>
<td></td>
</tr>
<tr>
<td>The system shows him again the form and informs him with a message</td>
<td></td>
</tr>
<tr>
<td>what the fields that he did not fill are.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-Conditions</th>
<th>The user is authenticated from the system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Conditions</td>
<td>The user adds a new competency to the observatory</td>
</tr>
<tr>
<td>Extends</td>
<td>None</td>
</tr>
<tr>
<td>Includes</td>
<td>None</td>
</tr>
<tr>
<td>Specific Requirements</td>
<td>None</td>
</tr>
<tr>
<td>Notes</td>
<td>None</td>
</tr>
</tbody>
</table>

Table 34: Description of Use Case – Create Competence

The Description of Use Case – Manage Jobs/Functions

<table>
<thead>
<tr>
<th>Manage Jobs/Functions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>A registered user can get into the system and manage the jobs/functions of the system</td>
</tr>
<tr>
<td>Actors</td>
<td>Registered User.</td>
</tr>
</tbody>
</table>
### Manage Jobs/Functions

| **Basic Flow** | The user gets into the system and presses the Jobs/Functions hyperlink from the menu  
The system shows a list with actions for managing the Jobs/Functions of the system |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alternative Flows</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Pre-Conditions</strong></td>
<td>The user is authenticated from the system</td>
</tr>
<tr>
<td><strong>Post-Conditions</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Extends</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Includes</strong></td>
<td>Create/Update Job/Function, Create/Update Job/Function level, Select Competences for Job/Function level</td>
</tr>
<tr>
<td><strong>Specific Requirements</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>None</td>
</tr>
</tbody>
</table>

**Table 35:** Description of Use Case – Manage Jobs/Functions

### The Description of Use Case – Create/Update Job/Function

<table>
<thead>
<tr>
<th><strong>Create/Update Job/Function</strong></th>
<th><strong>Description</strong></th>
<th>A registered user can get into the system and create a new job/function</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Actors</strong></td>
<td>Registered User.</td>
<td></td>
</tr>
</tbody>
</table>
**Create/Update Job/Function**

<table>
<thead>
<tr>
<th><strong>Basic Flow</strong></th>
<th>The user gets into the system and presses the Jobs/ Functions hyperlink from the menu.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The system shows a list of actions.</td>
</tr>
<tr>
<td></td>
<td>The user selects the Create/Update Job/Function.</td>
</tr>
<tr>
<td></td>
<td>The system shows a form with the Job/Function details that the user must fill.</td>
</tr>
<tr>
<td></td>
<td>The user submits the filled form.</td>
</tr>
<tr>
<td></td>
<td>The system informs the user if the submission was successful.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Alternative Flows</strong></th>
<th>The user did not fill all the fields that were required.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The system shows him again the form and informs him with a message what the fields that he did not fill are.</td>
</tr>
</tbody>
</table>

**Pre-Conditions**
The user is authenticated from the system

**Post-Conditions**
The user creates/updates the job/function

**Extends**
None

**Includes**
None

**Specific Requirements**
None

**Notes**
None

---

**Table 36: Description of Use Case – Create/Update Job/Function**

---

**The Description of Use Case – Create/Update Job/Function Level**
## Create/Update Job/Function Level

<table>
<thead>
<tr>
<th>Description</th>
<th>A registered user can get into the system and create/update a job/function level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actors</td>
<td>Registered User.</td>
</tr>
<tr>
<td>Basic Flow</td>
<td>The user gets into the system and presses the jobs/Functions hyperlink from the menu</td>
</tr>
<tr>
<td></td>
<td>The user selects a job/function</td>
</tr>
<tr>
<td></td>
<td>The user presses the create/update Job/Function Level</td>
</tr>
<tr>
<td></td>
<td>The system shows a form with the Job/Function Level details that the user must fill</td>
</tr>
<tr>
<td></td>
<td>The user submits the filled form</td>
</tr>
<tr>
<td></td>
<td>The system informs the user if the submission was successful</td>
</tr>
<tr>
<td>Alternative Flows</td>
<td>The user did not fill all the fields that were required.</td>
</tr>
<tr>
<td></td>
<td>The system shows him again the form and informs him with a message what the fields that he did not fill are.</td>
</tr>
<tr>
<td>Pre-Conditions</td>
<td>The user is authenticated from the system</td>
</tr>
<tr>
<td>Post-Conditions</td>
<td>The user creates/updates a Job/Function Level</td>
</tr>
<tr>
<td>Extends</td>
<td>None</td>
</tr>
<tr>
<td>Includes</td>
<td>None</td>
</tr>
<tr>
<td>Specific Requirements</td>
<td>None</td>
</tr>
<tr>
<td>Notes</td>
<td>None</td>
</tr>
</tbody>
</table>

Table 37: Description of Use Case – Create/Update Job/Function Level
The Description of Use Case – Select Competences for Job/Function Level

<table>
<thead>
<tr>
<th>Description</th>
<th>A registered user can get into the system and select the competences that must be acquired for a specific job/function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actors</td>
<td>Registered User</td>
</tr>
<tr>
<td>Basic Flow</td>
<td>The user gets into the system and presses the Job/Function hyperlink from the menu</td>
</tr>
<tr>
<td></td>
<td>The system shows the available jobs/functions</td>
</tr>
<tr>
<td></td>
<td>The user select a specific job/function</td>
</tr>
<tr>
<td></td>
<td>The user selects the Select Competences hyperlink</td>
</tr>
<tr>
<td></td>
<td>The system shows a list of Competences</td>
</tr>
<tr>
<td></td>
<td>The user selects the competences for the specific job/function level</td>
</tr>
<tr>
<td>Alternative Flows</td>
<td>None</td>
</tr>
<tr>
<td>Pre-Conditions</td>
<td>The user is authenticated from the system</td>
</tr>
<tr>
<td>Post-Conditions</td>
<td>The user selects competences for the specific job/function level</td>
</tr>
<tr>
<td>Extends</td>
<td>None</td>
</tr>
<tr>
<td>Includes</td>
<td>None</td>
</tr>
<tr>
<td>Specific Requirements</td>
<td>None</td>
</tr>
<tr>
<td>Notes</td>
<td>None</td>
</tr>
</tbody>
</table>

Table 38: Description of Use Case – Select Competences for Job/Function Level
### Appendix I: Detail Description of the Administrator Use Cases

#### The Description of Use Case – Manage News

<table>
<thead>
<tr>
<th>Manage News</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Actors</strong></td>
</tr>
</tbody>
</table>
| **Basic Flow** | The Administrator gets into the system and presses the View News hyperlink from the menu  
The system shows a list with the News of the observatory  
The Administrator can manage the available news |
| **Alternative Flows** | The system doesn’t show to the Administrator a list with the available news/announcements because there aren’t any |
| **Pre-Conditions** | The Administrator is authenticated from the system |
| **Post-Conditions** | The Administrator is viewing the available news |
| **Extends** | None |
| **Includes** | Remove News, Add News |
| **Specific Requirements** | None |
| **Notes** | None |

Table 39: Description of Use Case – Manage News

#### The Description of Use Case – Add News
### Add News

<table>
<thead>
<tr>
<th>Description</th>
<th>The Administrator can get into the system and add news about the observatory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actors</td>
<td>Administrator.</td>
</tr>
</tbody>
</table>
| Basic Flow  | The Administrator gets into the system and presses the Add News hyperlink from the menu.  
The system shows a form that the Administrator must fill.  
The Administrator submits the filled form.  
The system informs the Administrator if the submission was successful. |
| Alternative Flows | The Administrator did not fill all the fields that were required.  
The system shows him again the form and informs him with a message about the fields that he did not fill. |
| Pre-Conditions | The Administrator is authenticated from the system. |
| Post-Conditions | The Administrator add news to the observatory. |
| Extends    | None.                                                                       |
| Includes   | None.                                                                       |
| Specific Requirements | None. |
| Notes      | None.                                                                       |

| Table 40: Description of Use Case – Add News |

The Description of Use Case – Remove News

<table>
<thead>
<tr>
<th>Remove News</th>
</tr>
</thead>
</table>

TENCompetence – IST-2005-027087 - 309
<table>
<thead>
<tr>
<th>Description</th>
<th>The Administrator can get into the system and remove news</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actors</td>
<td>Administrator.</td>
</tr>
<tr>
<td>Basic Flow</td>
<td>The Administrator gets into the system and presses the View News hyperlink from the menu</td>
</tr>
<tr>
<td></td>
<td>The system shows a list with the available news of the observatory</td>
</tr>
<tr>
<td></td>
<td>The Administrator selects the news that he wants to remove and press the Delete hyperlink</td>
</tr>
<tr>
<td></td>
<td>The system informs the user if the deletion was successful</td>
</tr>
<tr>
<td>Alternative Flows</td>
<td>None</td>
</tr>
<tr>
<td>Pre-Conditions</td>
<td>The Administrator is authenticated from the system</td>
</tr>
<tr>
<td>Post-Conditions</td>
<td>The Administrator remove news from the observatory</td>
</tr>
<tr>
<td>Extends</td>
<td>None</td>
</tr>
<tr>
<td>Includes</td>
<td>None</td>
</tr>
<tr>
<td>Specific Requirements</td>
<td>None</td>
</tr>
<tr>
<td>Notes</td>
<td>None</td>
</tr>
</tbody>
</table>

**Table 41: Description of Use Case – Remove News**

**The Description of Use Case – Manage Registered Users**

<table>
<thead>
<tr>
<th>Manage Registered Users</th>
</tr>
</thead>
</table>

TENCompetence – IST-2005-027087 - 310
### Manage Registered Users

<table>
<thead>
<tr>
<th>Description</th>
<th>The Administrator can get into the system and manage the registered users of the observatory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actors</td>
<td>Administrator.</td>
</tr>
<tr>
<td>Basic Flow</td>
<td>The Administrator gets into the system and presses the Manage Users hyperlink from the menu</td>
</tr>
<tr>
<td></td>
<td>The system shows a list with specific actions</td>
</tr>
<tr>
<td>Alternative Flows</td>
<td>none</td>
</tr>
<tr>
<td>Pre-Conditions</td>
<td>The Administrator is authenticated from the system</td>
</tr>
<tr>
<td>Post-Conditions</td>
<td>None</td>
</tr>
<tr>
<td>Extends</td>
<td>None</td>
</tr>
<tr>
<td>Includes</td>
<td>View Registered Users, Delete Users</td>
</tr>
<tr>
<td>Specific Requirements</td>
<td>None</td>
</tr>
<tr>
<td>Notes</td>
<td>None</td>
</tr>
</tbody>
</table>

Table 42: Description of Use Case – Manage Registered Users

### View Registered Users

<table>
<thead>
<tr>
<th>Description</th>
<th>The Administrator can get into the system and view the registered users of the observatory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actors</td>
<td>Administrator.</td>
</tr>
</tbody>
</table>
**View Registered Users**

| Basic Flow | The Administrator gets into the system and presses the View Users hyperlink from the menu |
|            | The system shows a list with the registered users of the observatory |
|            | The Administrator can select to see the analytic profile of a specific user |

| Alternative Flows | The Administrator presses the Search Users hyperlink |
|                  | The system shows the screen with the appropriate search conditions. |
|                  | The Administrator inserts his key-words into the optional blank fields. |
|                  | The system allocates the records from the database that match with the search criteria and shows the results to the Administrator. |
|                  | The system shows a list with the available users based on the search criteria |
|                  | The Administrator can select to see the analytic profile of a specific user |

| Pre-Conditions   | The Administrator is authenticated from the system |
| Post-Conditions  | The Administrator is viewing the registered users of the observatory |
| Extends          | None |
| Includes         | None |
| Specific Requirements | None |
| Notes            | None |

**Table 43: Description of Use Case – View Registered Users**

**The Description of Use Case – Delete Users**

<table>
<thead>
<tr>
<th>Delete Users</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Delete Users</strong></td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>The Administrator can get into the system and delete some of the registered users of the observatory</td>
</tr>
<tr>
<td><strong>Actors</strong></td>
<td>Administrator</td>
</tr>
<tr>
<td><strong>Basic Flow</strong></td>
<td>The Administrator gets into the system and presses the Manage Users hyperlink from the menu. The system shows a list with the registered users of the observatory. The Administrator selects the user that he wants to delete and presses the Delete User hyperlink. The system informs the Administrator if the deletion was successful.</td>
</tr>
<tr>
<td><strong>Alternative Flows</strong></td>
<td>The Administrator presses the Search Users hyperlink. The system shows the screen with the appropriate search conditions. The Administrator inserts his key-words into the optional blank fields. The system allocates the records from the database that match with the search criteria and shows the results to the Administrator. The system shows a list with the available users based on the search criteria. The Administrator selects the user that he wants to delete and presses the Delete User hyperlink. The system informs the Administrator if the deletion was successful.</td>
</tr>
<tr>
<td><strong>Pre-Conditions</strong></td>
<td>The Administrator is authenticated from the system</td>
</tr>
<tr>
<td><strong>Post-Conditions</strong></td>
<td>The Administrator is deleting a user from the observatory</td>
</tr>
<tr>
<td><strong>Extends</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Includes</strong></td>
<td>None</td>
</tr>
</tbody>
</table>
### Delete Users

<table>
<thead>
<tr>
<th>Specific Requirements</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes</td>
<td>None</td>
</tr>
</tbody>
</table>

**Table 44: Description of Use Case – Delete Users**

The Description of Use Case – Manage Links

<table>
<thead>
<tr>
<th>Manage Links</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Actors</strong></td>
</tr>
</tbody>
</table>
| **Basic Flow** | The Administrator gets into the system and presses the Manage Links hyperlink from the menu  
The system shows a list with the Links of the observatory  
The Administrator can manage the available Links |
| **Alternative Flows** | The system doesn’t show to the Administrator a list with the available Links because there aren’t any |
| **Pre-Conditions** | The Administrator is authenticated from the system |
| **Post-Conditions** | The Administrator is viewing the available Links |
| **Extends** | None |
| **Includes** | Remove Links, Add Links |
| **Specific Requirements** | None |
### Manage Links

| Notes | None |

**Table 45: Description of Use Case – Manage Links**

#### The Description of Use Case – Add Links

<table>
<thead>
<tr>
<th>Add Links</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Actors</strong></td>
</tr>
<tr>
<td><strong>Basic Flow</strong></td>
</tr>
<tr>
<td><strong>Alternative Flows</strong></td>
</tr>
<tr>
<td><strong>Pre-Conditions</strong></td>
</tr>
<tr>
<td><strong>Post-Conditions</strong></td>
</tr>
<tr>
<td><strong>Extends</strong></td>
</tr>
<tr>
<td><strong>Includes</strong></td>
</tr>
<tr>
<td><strong>Specific Requirements</strong></td>
</tr>
</tbody>
</table>
### Table 46: Description of Use Case – Add Links

<table>
<thead>
<tr>
<th>Description</th>
<th>The Administrator can get into the system and remove Links</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actors</td>
<td>Administrator.</td>
</tr>
<tr>
<td>Basic Flow</td>
<td>The Administrator gets into the system and presses the Manage Links hyperlink from the menu. The system shows a list with the available Links of the observatory. The Administrator selects the Links that he wants to remove and press the Delete hyperlink. The system informs the user if the deletion was successful.</td>
</tr>
<tr>
<td>Alternative Flows</td>
<td>None</td>
</tr>
<tr>
<td>Pre-Conditions</td>
<td>The Administrator is authenticated from the system</td>
</tr>
<tr>
<td>Post-Conditions</td>
<td>The Administrator remove Links from the observatory</td>
</tr>
<tr>
<td>Extends</td>
<td>None</td>
</tr>
<tr>
<td>Includes</td>
<td>None</td>
</tr>
<tr>
<td>Specific Requirements</td>
<td>None</td>
</tr>
<tr>
<td>Notes</td>
<td>None</td>
</tr>
</tbody>
</table>
Table 47: Description of Use Case – Remove Links

<table>
<thead>
<tr>
<th>Description</th>
<th>The Administrator can get into the system and view the Resources that are presented to the normal users of the TenC Competence Observatory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actors</td>
<td>Administrator.</td>
</tr>
<tr>
<td>Basic Flow</td>
<td>The Administrator gets into the system and presses the Manage Resources hyperlink from the menu</td>
</tr>
<tr>
<td></td>
<td>The system shows a list with the Resources of the observatory</td>
</tr>
<tr>
<td></td>
<td>The Administrator can manage the available resources</td>
</tr>
<tr>
<td>Alternative Flows</td>
<td>The system doesn’t show to the Administrator a list with the available resources because there aren’t any</td>
</tr>
<tr>
<td>Pre-Conditions</td>
<td>The Administrator is authenticated from the system</td>
</tr>
<tr>
<td>Post-Conditions</td>
<td>The Administrator is viewing the available resources</td>
</tr>
<tr>
<td>Extends</td>
<td>None</td>
</tr>
<tr>
<td>Includes</td>
<td>Remove Resources, Add Resources</td>
</tr>
<tr>
<td>Specific Requirements</td>
<td>None</td>
</tr>
<tr>
<td>Notes</td>
<td>None</td>
</tr>
</tbody>
</table>

Table 48: Description of Use Case – Manage Resources

The Description of Use Case – Add Resources
The Description of Use Case – Add Resources

<table>
<thead>
<tr>
<th>Description</th>
<th>The Administrator can get into the system and add resources about the observatory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actors</td>
<td>Administrator.</td>
</tr>
</tbody>
</table>
| Basic Flow  | The Administrator gets into the system and presses the Add Resources hyperlink from the menu  
               The system shows a form that the Administrator must fill  
               The Administrator submits the filled form  
               The system informs the Administrator if the submission was successful |
| Alternative Flows | The Administrator did not fill all the fields that were required.  
                        The system shows him again the form and informs him with a message about the fields that he did not fill |
| Pre-Conditions | The Administrator is authenticated from the system |
| Post-Conditions | The Administrator add resources to the observatory |
| Extends     | None                                                                           |
| Includes    | None                                                                           |
| Specific Requirements | None |
| Notes       | None                                                                           |

Table 49: Description of Use Case – Add Resources
**Remove Resources**

<table>
<thead>
<tr>
<th>Description</th>
<th>The Administrator can get into the system and remove resources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Actors</strong></td>
<td>Administrator</td>
</tr>
</tbody>
</table>
| **Basic Flow** | The Administrator gets into the system and presses the Manage Resources hyperlink from the menu  
The system shows a list with the available resources of the observatory  
The Administrator selects the resources that he wants to remove and press the Delete hyperlink  
The system informs the user if the deletion was successful |
| **Alternative Flows** | None |
| **Pre-Conditions** | The Administrator is authenticated from the system |
| **Post-Conditions** | The Administrator remove resources from the observatory |
| **Extends** | None |
| **Includes** | None |
| **Specific Requirements** | None |
| **Notes** | None |

Table 50: Description of Use Case – Remove Resources
### Appendix J: Events

<table>
<thead>
<tr>
<th>Member M</th>
<th>Action A</th>
<th>ActionParametersAP</th>
<th>Object O</th>
<th>Time T</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agent</td>
<td>provides_rationale</td>
<td></td>
<td>Member</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agent</td>
<td>recommends_CDO</td>
<td>&quot;CDO17&quot;</td>
<td>Member</td>
<td></td>
<td>Don't forget that a CDO can be a Book, a person…</td>
</tr>
<tr>
<td>Agent</td>
<td>recommends_game</td>
<td>&quot;Member2&quot;</td>
<td>Member</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agent</td>
<td>suggests_information</td>
<td>&quot;Competence&quot;</td>
<td>Member</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agent</td>
<td>suggests_information</td>
<td>&quot;Objective&quot;</td>
<td>Member</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agent</td>
<td>suggests_information</td>
<td>&quot;Interest&quot;</td>
<td>Member</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agent</td>
<td>updates_metrics</td>
<td>&lt;self&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Member</td>
<td>activates_agent</td>
<td>&quot;CDOConnectionAgent&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Member</td>
<td>adds_to_buddy_list</td>
<td>&quot;Member2&quot;</td>
<td>Member</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Member</td>
<td>asks_rationale</td>
<td>&quot;Member2&quot;</td>
<td>Agent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Member</td>
<td>chats_with</td>
<td>&quot;Member2&quot;</td>
<td>Member</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Member</td>
<td>checks_out_recommended_CDO</td>
<td></td>
<td>CDO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Member</td>
<td>completes_CDO</td>
<td>&quot;CDO19&quot;</td>
<td>CDO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Member</td>
<td>connects_CDOs</td>
<td>&quot;CDO17&quot;, &quot;CDO18&quot;</td>
<td>CDO</td>
<td></td>
<td>This happens when a member edits_profile_field of a CDO and happens the description of another CDO. Should it be recorded as an event then</td>
</tr>
<tr>
<td>Member</td>
<td>contributes</td>
<td>&quot;forum&quot;</td>
<td>CDO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Member</td>
<td>contributes</td>
<td>&quot;blog&quot;</td>
<td>CDO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Member</td>
<td>creates_account</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Member</td>
<td>creates_CDO</td>
<td></td>
<td>CDO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Member creates_profile

Member deletes_account

Member deletes_CDO ("CDO19") CDO

Member disconnects_CDOs ("CDO17", "CDO18") CDO

Member edits_profile_field ("name", "Bertrand Sereno") <self>

Member edits_profile_field ("subtype", "Book") CDO

Member follows_agent_recommendation ("CDOConnectionAgent") Agent

Member initiates_CDO ("CDO19") CDO

Member logs_in

Member logs_out

Member play_game_with ("Member2") Member

Member quits_game ("Member2") Member

Member refuses_agent_recommendation ("CDOConnectionAgent") Agent

Member removes_from_buddy_list ("Member2") Member

Member selects_navigation_option (filter_by_subtype, "Book")

Member selects_navigation_option (filter_by_subtype, "Tutorial")

Member selects_navigation_option (filter_by_type, "Non-interactive material")

Member selects_navigation_option (focus_on_subject, "NSTSD")

Member selects_navigation_option (display_only, "My network")

This happens when a member edits_profile_field of a CDO and happens of another CDO. Should it be recorded as an event then?

Editing my profile

Editing a CDO profile
Member selects navigation option (set_separation_degree, "2")
Appendix K: Activity Diagram

Syntax: MemberM (does) ActionA (involving) ObjectO (at) TimeT

- Agent provides_rationale -> Member 18706...
- Agent recommends_CDO("CDO1") -> Member
- Agent recommends_game("Member2") -> Member
- Agent suggests_information("Competence") -> Member
- Agent suggests_information("Objective") -> Member
- Agent suggests_information("Interest") -> Member
- Agent updates_metrics -> <self>
- Member activates_agent("CDOConnectionAgent") -> Member
- Member asks_rationale -> Agent
- Member chat_with("Member2") -> Member
- Member checks_out_recommended_CDO -> CDO
- Member connects_CDO("CDO1", "CDO18") -> CDO
- Member contributes("forum") -> CDO
- Member creates_account -> CDO
- Member creates_CDO -> CDO
- Member creates_profile -> CDO
Appendix L: Navigation Diagram
Appendix M Activity diagram

The activity diagram describes the system of ad hoc transient communities into some detail. It provides a quite detailed flow through the process and suggests several algorithms for various steps. For clarity sake, the handling of the request for support (tutee asking content question) and tutor selection are presented in two separate diagrams, but both processes will take place in parallel. Therefore some actions seem to be duplicated, but are not.

Figure 54: Request handling
The starting point of both diagrams is a user who has been enrolled in a learning network and has signed on.

1 Fill in question form
Some Learner asks a Content related Question (CQ).
This is where it all starts. Only questions that pertain to the content are permissible. Questions about procedures or administrative issues are not allowed.
- Procedural questions could of course be treated in a similar way. This is out of scope, though.
- A question asked will usually pertain to some Activity Node (AN) the Learner happens to study. This need not be the case, though. Learners may ask questions about several of the ANs they have studied thus far, even about ANs that are part of the LN, but weren't studied by the learners as the positioning system indicated they were part of his or her prior experience.

2 Valid?
Check whether the CQ is formally correct.
If not correct, it gets rejected immediately. Formally correct means whether the form used to submit the question has been filled in fully.
• This step may be skipped. It is mentioned here, because it might be useful.
• Since the CQ is being shown to some of the LNUs and to the LSA engine (see steps 4
and 6), it should at least be sufficiently detailed for both the tutor and LSA engine to
work on. Perhaps a minimal number of meaningful words (i.e. words after stopping
and stemming) could be used as a criterion.
In this step, it could be checked whether the question is non-procedural. Perhaps a
LSA algorithm could be used to establish the likelihood of it being procedural. Rather
than reject the question outright, it could ask the learner whether the question really is
content related or, after all, procedural. A standard collection of procedural
documents could be used as a benchmark.
• In this step, the system could also check whether the question contains an indica-
tion of the AN the CQ belongs to and perhaps also the stage to which the learner has
progressed within the AN (see 10).

3 Archive question form
Log CQ and AN
Log merely means adding the question to the requester's personal database for reuse by
him or her later on. Having an overview of questions asked, linked to the forum thread in
which they have been answered is a useful service to the user.
• Whether the log is going to be used in other ways depends on what additional
functionality (in the form of use cases) the system should address. Only something as
simple as the frequency distribution of questions asked (number of users asking 1, 2,
3, ... questions) already is an interesting community statistic; another one would be
the number of questions per AN (or document within an AN). Obviously, these
statistics would be computed by a system-wide agent, like the match maker.
• The registration could include the AN that the learner is currently studying: <CQ,
AN>, perhaps even the stage he or she is in.

4 Communicate with LSA module
Carry out LSA on CQ
The purpose of this step is to find out the relevance of each AN for answering the CQ.
Clearly, some ANs are more relevant than others. When trying to find a tutor to answer
the CQ, the relevance of the ANs for the CQ is used to weigh each tutor's content and
tutoring expertise (see steps 5 and 6): the more relevant an AN, the more a tutor's
expertises should count. With the help of the LSA module, all documents in the entire
Learning Network, arranged by AN, are compared with the question and the correlation
coefficients are computed. All documents belonging to some AN are pooled. Then a
listing is produced of <correlation, activity node ID> doublets. It is assumed that a high
correlation points to a high relevance and vice versa. Relevance may be represented by
the relevance vector (a column vector) Ra1 = [r1 .. rj .. ra], where a is the number of ANs
and rj the relevance for the j-th AN
• The documents are pooled rather than, say, averaging the correlation coefficients of
the various documents per AN. This is done to avoid effects like the following: an
AN that contains one document with r=0.9 and 9 with r=0.2 scores lower (0.027) than
an AN that contains one document only with r=0.3.
For heterogeneous ANs, this is a serious problem as they get 'averaged out'.
Alternatively, we could have chosen not to average the coefficients, but to use the maximum coefficient. It should be possible to figure out what operation on the document correlation coefficients yields the same result as the pooling of the documents. Not pooling them may be preferable in view of step 7, in which suggestions for answers to the CQ are extracted. This requires a resolution even at the level of paragraphs rather than the AN as a whole. But perhaps, this needs to be seen as two distinct steps.

5 Compute suitability peer tutors
Compute tutor suitability
All other LNUs, or rather their personal assistants, are now asked to evaluate their suitability to offer support to the learner, that is, to provide an answer to the CQ, however preliminary. This activity consists of 4 sub-activities that can be carried out in parallel. They are described below.

5a From an LNU's dossier, determine his or her content competency with respect to CQ.
Someone's competency level describes this person mastery of the learning objectives of some AN, hence the term 'content competency'. Competency levels vary between 0 and 1; 0 means not completed, 1 means completed. They can be represented by the vector $C_{1a} = [c_1 \ldots c_i \ldots c_a]$ where $a$ is the number of ANs and $c_i$ the content competency on the $i$-th AN. These content competencies need to be adjusted so as to reflect their relevance to CQ. Content competency with respect to an AN irrelevant to CQ should be ignored (receive weight 0), content competency with respect to an AN highly relevant to CQ should be taken into account (say, receive weight 0.9). Therefore, each $c_i$ needs to be weighted by the relevant of ANj for CQ. This is done by multiplying the competency (row) vector $C_{1a}$ with the (column) vector $R_{a1}$. This gives:

$$C_{1a} \cdot R_{a1} = (c_1 \cdot r_1 + c_2 \cdot r_2 + \ldots + c_a \cdot r_a)$$

$$\frac{C_{1a} \cdot R_{a1}}{a} = C$$

Division by a is done to make sure that $0 \leq C \leq 1$. $C$ is called the consolidated content competency.

- Competencies are hard to measure, they can be measured through assessments, but that is a route we don't want to go for obvious reasons. Failing this option, our best measure of someone's competency on some ANj is i) whether he or she has completed ANj successfully, perhaps added with information on ii) how long ago that was (assuming that mastery fades with time).
- Someone who has just completed some ANj is more competent than someone who has done this sometime ago; unless, of course, the latter person has pursued further studies that build on ANj. That too should then be reflected in his or her dossier and could be taken into account.
- To add some more sophistication, those who are still studying a particular AN (and hence also are learners), may receive a content competency between 0 and 1.
- Content competency should take into account someone's previous experience, as reflected in his her portfolio (positioning!).
- To compute content competency, the following rules could be taken into account:

  - IF the tutor is not actively working on one or more of the relevant activity nodes THEN the tutor receives content competency 0.
5b From an LNU's dossier, determine his or her tutor competency with respect to CQ
Someone's content competency is related to but different than someone's tutoring competency. Someone who has good mastery of some subject doesn't necessarily make for a good tutor. And, vice versa, someone with average content competency may make an excellent tutor. Indeed, someone who has no content competency cannot be a tutor at all. So the system has to distinguish between content competency and tutor competency.
In this step, the tutoring competency of some LNU is computed from his or her portfolio. As with content competencies, tutor competencies will vary over ANs. Via a procedure similar to the one followed in step 5a, we arrive at the consolidated tutoring competency vector T.
- For the time being, we assume that all LNUs have tutor competency 1, but this need be changed soon as tutoring competency is a crucial factor in arriving at satisfactory answers. A little more sophistication could be added by giving expert LNUs a value of 1 and giving peers a smaller value (0.5).
- A tutor's past performance should preferably be taken into account. It could be based on some sort of rating (kudos) given by learners whose content questions were answered in the past and who were asked to rate the answer.
- It may be assumed that more 'difficult' questions (according to some measure) require tutors with a higher level of tutor competency. This could be achieved in step 7, by giving tutoring competency and greater load than content competency. Lacking a 'difficulty measure', we will not take this into account and assume that all questions are of equal difficulty.

5c Restrict a tutor's eligibility
Some LNUs will have more expertise than others, either from previous experience (see positioning) or because of their history in the LN. Tutoring is a matter of making your expertise available to the community to answer questions of fellow LNUs with less expertise. The tutoring load may increase rapidly with increasing expertise. After all, experts by definition are able to answer many different questions, beginners only few. This is unequal spread of the tutoring load is undesirable. The effort an LNU is willing to spend on tutoring is limited and largely independent on his or her expertise. Asking too many questions would thus lead to the quick exclusion of the expert tutors from the community structure. The question therefore is how to spread the tutoring load evenly. There is an additional, pedagogical twist to this argument. If tutoring is an educationally valuable experience per se - and not just a matter of community service - then LNUs should act as tutors for CQs that relate to ANs they have mastered themselves just yet. For those ANs, the educational value is likely to be maximal. An LNU's eligibility is the degree to which a particular LNU is preferred over others because of experience and workload considerations. [An appropriate way to measure eligibility still needs to be developed]
- In relatively small communities, a random drawing could be used since the number of LNUs would be too small to make some ineligible. This could be done as a first approximation.

5d Determine tutor availability
Tutor availability should at least take into account a past tutor load. Someone who has answered many questions over the last few weeks should be exempted; someone who has answered few questions only so far should be preferred also so as to ensure that all LNUs get equal opportunity to perform a tutor role.

If we plot a frequency distribution of the number of ANs a tutor is competent for (both content and tutoring competency) against the number of tutors, in all likelihood few LNUs will be suited to answer almost all questions (as they have high competencies on all ANs) and many LNUs will be suited to answer a few only (as they are competent with respect to only one or two ANs). Even if we were to randomly distribute CQ requests over all competent tutors, the load would be unevenly spread over the tutors: Those who are competent for more ANs will proportionally receive more requests. Since we want to spread the tutoring load evenly, this effect has to be compensated for, by making the tutor availability depend on the past tutor load.

Availability = Ai

- Preferably, a measure more sophisticated than the total workload over some period of time should be developed. It could for instance take into account both the number of questions and the time lapsed since they were first asked.
- If suitability computing is done centrally, in the interest of maximising the chance of at all obtaining a reaction to a request to participate, the tutor's online status (online versus offline), perhaps even the expected online status could be taken into account.
- Another rule that may be considered is: - IF the time a tutor has available for performing a tutoring role until the due date of the question is less than the time it takes to answer the question THEN the tutor is NOT available. (This presupposes a due date; due dates may be provided by the learner or by the system itself, which sets a time horizon before which the question has to be answered.)

The results of steps 5a through 5d - that is an LNU's consolidated content competency Ci, his or her consolidated tutoring competency Ti, eligibility Ei, and availability Ai - are now used to determine the tutor's overall suitability Si.

Si = k1 * Ci * k2 * Ti * k3 * Ei * k4 * Ai

The Ks are introduced to weigh the relative effects of the various factors. For example, the effect of a tutor's content competency could be half the effect of his or her tutoring competency, etc. Furthermore, 0 ≤ k ≤ 1.

- Here, consolidated content competency, consolidated tutor competency and eligibility and availability have all been expressed as numerical values between 0 and 1. This allowed us to compute the overall suitability S. But an alternative approach could have been followed. Suppose that an initial ad hoc community is formed after having computed the overall competency from the content competency and tutor competency. Eligibility or availability (both or either one) could now have been used to trim the size of this initial ad hoc community. Applying eligibility criteria already results to the elimination of some tutors, availability criteria could remove more, if needed. What approach is chosen depends on the ease with which the eligibility and availability vectors may be computed and the extent to which eligibility and availability could perhaps be captured more truthfully in a set of logical, if-then rules. This also results in different diagram. In the present case, a tutor's suitability is
computed by his or her Personal Agent. In the proposed case, eligibility and availability considerations need to be pulled in by the Matchmaker Agent. This means more central processing (assuming that the PAs are client side agents. If they aren't, the argument changes.).

6 Invite most suitable LNU peer tutors
Invite tutors by suitability ranking
The individual tutor suitability $S_i$ is now collected for every tutor. Their rank order from the largest to the smallest represents the order in which LNUs should be invited to participate in the ad hoc community.
- If suitabilities are computed on the client side, the chances that the LNUS are actually available immediately for participation in the ad hoc community, is maximised.

7 Retrieve possible answer
Carry out detailed LSA
A new LSA may well be needed to seed the ad hoc community with proto-answers. In step 4, all documents in any one AN were pooled. This is adequate if the objective is to create a relevance ranking of content and tutor competencies. If, however, the objective is to produce proto-answers even whole documents lack sufficient resolution.
- Perhaps documents need even to be split up down to their paragraph level, at which stage an LSA is performed. If thus sufficiently high and distinct correlations can be produced, these are bound to be very helpful. The literature and perhaps some experiments with actual materials should shed light in this matter.

8 Invite LNU peer tutor
Invite i-th tutor
The tutor gets an invitation (by e-mail, by notification, by sms, by instant message?). The message contains the CQ and the list documents within ANs that the LSA has shown to be relevant to the drafting of an answer.
- An expiration moment should be set on the invitation to join to avoid a stall of the community formation. This moment should be in the order of hours at most, its duration also depending on the foreseen community size (the larger, the shorter).

9 Invitation
Join the ad hoc community?
The tutor may either refuse or agree to join (by clicking a pertinent URL?). If a tutor were to either accept or reject after expiration of the invitation, he or she should receive a message to the effect that the invitation has expired.
- Should there be a mechanism available still to join the community? It seems wise to allow people in who are motivated to do so.

10 Log acceptance, question form and possible answer
Log tutor participation
Include the thread’s ID (in the form of a permanent hyperlink) so that the tutor is always able to go back to this thread.
11 Enough tutors?

An optimal size of the community should be decided upon. It should not be too small, otherwise the learner has to wait too long for a response to appear and loses faith in the system; not too many, otherwise LNUs might have to spend too much time answering questions by fellow LNUs. A size of 5 tutors seems reasonable.

12 Facilitate discussion platform

Create ad hoc community as a forum thread

The tutors will be asked to draft an answer to the CQ. In the interest of community building, all tutors should be approached at the same time to form an ad hoc community centred on the CQ. We propose that some open source forum software (Colloquia?) be used so that, in case of need, the software can easily be adapted to the ASA system.

- Community members could be allowed to bring in others whom they know to have pertinent expertise. Clearly, the invitation should be accompanied with the LSA results and, if they accept the invitation, their participation should be properly logged.
- Organised by CQ, threads may be made available to the LN as a kind of FAQs. They should not become a new AN, as they do not qualify for a full-fledged AN. This gives the LN a history and thus adds to its identity. This, in turn, should enhance community formation.
- Threads may be made available for LSA analysis at a later stage. This will prevent that lessons learned in a thread are forgotten; it will also speed up and ease the drafting of answers by tutors.

13 Formulate contribution

Both tutors and tutees formulate contributions to the discussion in the community.

14 Archive contribution

The contributions of the tutees and tutors are archived by the LNU agent.

15 Evaluate discussion

After each contribution the tutees and tutors evaluate this contribution.

16 Satisfied?

When a tutee or tutor is not satisfied with the contribution he or she can add a new one to the community.

17 Stop discussion

When the tutee is satisfied with the answers given in the discussion in the community the discussion is stopped. (Tutors can never stop a discussion).

18 Archive discussion

When a discussion is stopped by the tutee, the discussion is archived.

19 Rate tutor
The tutee can rate the tutor about the manner in which support was provided. This rating can then be taken into account in step 5.

**Update calendar**
The LNU or his personal agent needs to provide availability data, for example via an electronic calendar in the system. This data is needed to be able to calculate tutor availability and react on due times (steps 5, 8, 10 and 11).

**Update dossier**
Performance data, such as completion of activity nodes has to be logged in the LNU’s dossier. This data is required for step 4 and 5.

**Retrieve competence data from system**
For an effective system, parameters for tutor suitability, in particular content and tutor competency should be logged. This is required for step 5 and is related to step 19.
Appendix N Use case diagram

Figure 56: Peer tutoring use case model
<table>
<thead>
<tr>
<th>Name</th>
<th>Sign up to LN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary</td>
<td>The LNU identifies him/herself in the LN.</td>
</tr>
<tr>
<td>Actors</td>
<td>LNU</td>
</tr>
<tr>
<td>Assumptions</td>
<td>The LN is accessible.</td>
</tr>
<tr>
<td>Description</td>
<td>The LNU fills in his/her name to login to the system. The system checks the LNU ID and if the ID is known by the system the LNU's personal setting and data are loaded.</td>
</tr>
<tr>
<td>Exceptions</td>
<td>The login fails when the LNU ID is not known by the system.</td>
</tr>
<tr>
<td>Results</td>
<td>The LNU is logged in the LN.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Update electronic calendar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary</td>
<td>The LNU updates his/her electronic calendar.</td>
</tr>
<tr>
<td>Actors</td>
<td>LNU</td>
</tr>
<tr>
<td>Assumptions</td>
<td>The LNU is logged in the LN and his/her electronic calendar is available.</td>
</tr>
<tr>
<td>Description</td>
<td>The LNU accesses his/her electronic calendar, checks it and updates it.</td>
</tr>
<tr>
<td>Exceptions</td>
<td>NA</td>
</tr>
<tr>
<td>Results</td>
<td>The electronic calendar of the LNU is updated.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Ask CQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary</td>
<td>The tutee fills in a question form and asks a question.</td>
</tr>
<tr>
<td>Actors</td>
<td>Tutee</td>
</tr>
<tr>
<td>Assumptions</td>
<td>The tutee is logged in and has access to a question form.</td>
</tr>
<tr>
<td>Description</td>
<td>The tutee fills in an electronic question form which is taken up by the system. The system checks the type of the question and if it is a content question than the question is accepted by the system for further processing.</td>
</tr>
<tr>
<td>Exceptions</td>
<td>Other questions than content questions are not accepted by the system.</td>
</tr>
<tr>
<td>Results</td>
<td>The tutee asks a content question and the content question is stored.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Send question form to LSA module</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary</td>
<td>The reformed question form is send to the LSA module.</td>
</tr>
<tr>
<td>Actors</td>
<td>Agent Matchmaker</td>
</tr>
<tr>
<td>Assumptions</td>
<td>A content question is asked.</td>
</tr>
<tr>
<td>Description</td>
<td>The reformed question form is send to the LSA module for further processing.</td>
</tr>
<tr>
<td>Exceptions</td>
<td>NA</td>
</tr>
<tr>
<td>Results</td>
<td>The LSA module is provided with input.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Send question form to Agent Matchmaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary</td>
<td>The question form is send to the Agent Matchmaker.</td>
</tr>
<tr>
<td>Actors</td>
<td>Agent Tutee</td>
</tr>
<tr>
<td>Assumptions</td>
<td>The question form is available and correct.</td>
</tr>
<tr>
<td>Description</td>
<td>The question form that is filled in by the Tutee is send to the Agent Matchmaker by the Agent Tutee.</td>
</tr>
<tr>
<td>Name</td>
<td>Process CQ</td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
</tr>
<tr>
<td>Summary</td>
<td>The content question is processed by the Agent Matchmaker and the Agent Tutee.</td>
</tr>
<tr>
<td>Actors</td>
<td>Agent Matchmaker, Agent Tutee</td>
</tr>
<tr>
<td>Assumptions</td>
<td>The question form is send by the Agent Tutee to the Agent Matchmaker.</td>
</tr>
<tr>
<td>Description</td>
<td>The Agent Matchmaker receives a question form and reforms it into input for the LSA Module. The Agent Tutee provides the Tutee with a question form.</td>
</tr>
<tr>
<td>Exceptions</td>
<td>NA</td>
</tr>
<tr>
<td>Results</td>
<td>The content question is saved in a question form and reformed to LSA module input.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Process output for community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary</td>
<td>The Agent Matchmaker processes the output of the LSA module.</td>
</tr>
<tr>
<td>Actors</td>
<td>Agent Matchmaker</td>
</tr>
<tr>
<td>Assumptions</td>
<td>The LSA generated output.</td>
</tr>
<tr>
<td>Description</td>
<td>The LSA Module provides the Agent Matchmaker with information on the ANs a content question belongs to. The LSA Module provides the Agent Matchmaker with shreds of documents in which the answer to the content question could be found.</td>
</tr>
<tr>
<td>Exceptions</td>
<td>The output of the LSA module is empty and as a result a new content question has to be formulated by the Tutee.</td>
</tr>
<tr>
<td>Results</td>
<td>Identification of the origin of the content question and input for the community in the form of shreds of relevant documents.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Form community with tutee(s) and tutor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary</td>
<td>Based on the LSA output, the electronic calendar and the electronic dossier suitable tutors are identified that form a community.</td>
</tr>
<tr>
<td>Actors</td>
<td>Agent Matchmaker</td>
</tr>
<tr>
<td>Assumptions</td>
<td>The LSA engine generated output. The electronic calendar and the electronic dossier are updated.</td>
</tr>
<tr>
<td>Description</td>
<td>The Agent Matchmaker matches the ANs to which a content question belongs to the ANs in a LNU portfolio to determine the LNUs content competence, based on the LSA output. The Agent Matchmaker uses the electronic calendar to determine the availability of the LNU and the electronic dossier is used to determine the LNUs tutor competence. The Agent Matchmaker calculates the most eligible LNUs that could act as a tutor.</td>
</tr>
<tr>
<td>Exceptions</td>
<td>No suitable tutor can be found.</td>
</tr>
<tr>
<td>Results</td>
<td>Suitable tutors are identified among the LNUs.</td>
</tr>
</tbody>
</table>
## Invite community members

**Name:** Invite community members  
**Summary:** Suitable tutor(s) are invited to join the community.  
**Actors:** Agent Matchmaker  
**Assumptions:** Sufficient users are registered in the learning network and at least one suitable tutor is identified.  
**Description:** The Agent Matchmaker sends invitations to the tutee as well as the suitable tutor(s) to invite them to join the community.  
**Exceptions:** NA  
**Results:** The tutee and the suitable tutor(s) receive an invitation to join the community.

## Handle invitation

**Name:** Handle invitation  
**Summary:** The invitation to join the community is accepted or declined.  
**Actors:** Agent LNU, LNU  
**Assumptions:** The LNU has logged in the LN.  
**Description:** The invitation to join the community is accepted or declined by the LNU through the LNU agent.  
**Exceptions:** NA  
**Results:** The LNU does or does not join the community which is communicated to the LN by the Agent LNU. When the LNU declines the invitation, new tutors are invited (refer use case invite community members and form community).

## Send input discussion

**Name:** Send input discussion  
**Summary:** The LSA module output is send to the community.  
**Actors:** Agent Matchmaker  
**Assumptions:** The LSA module generated output.  
**Description:** The shreds of documents that contain possible answers to the content question are sent to the community by the Agent Matchmaker.  
**Exceptions:** NA  
**Results:** Shreds of documents that contain possible answers are available in the community.

## Process input discussion

**Name:** Process input discussion  
**Summary:** The possible answers are made available to the Tutor through the Agent Tutor.  
**Actors:** Agent Tutor  
**Assumptions:** The LSA module generated possible answers.  
**Description:** The possible answers are made available to the Tutor through the Agent Tutor.  
**Exceptions:** NA  
**Results:** The possible answers can be accessed by the Tutor.
<table>
<thead>
<tr>
<th>Name</th>
<th>Ask for clarification CQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary</td>
<td>The tutee asks for clarification of an answer provided by a tutor.</td>
</tr>
<tr>
<td>Actors</td>
<td>Tutee</td>
</tr>
<tr>
<td>Assumptions</td>
<td>The tutee asked a content question and received at least one answer to this content question.</td>
</tr>
<tr>
<td>Description</td>
<td>The system sends the answers from the tutors to the tutee. The tutee reads these answers and when they are not entirely clear to him/her he/she asks for clarification of these answers through interaction with the community.</td>
</tr>
<tr>
<td>Exceptions</td>
<td>NA</td>
</tr>
<tr>
<td>Results</td>
<td>A request for clarification is send to the community.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Draft answers to CQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary</td>
<td>The tutor generates or edits answers to the content question.</td>
</tr>
<tr>
<td>Actors</td>
<td>Tutor</td>
</tr>
<tr>
<td>Assumptions</td>
<td>A content question is put forward and a community is formed.</td>
</tr>
<tr>
<td>Description</td>
<td>The tutor uses the community to provide the tutee with a possible answer to his/her content question.</td>
</tr>
<tr>
<td>Exceptions</td>
<td></td>
</tr>
<tr>
<td>Results</td>
<td>An answer to the content question is put forward in the community.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Archive rounded up discussion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary</td>
<td>The rounded up discussion is archived by the agent tutee.</td>
</tr>
<tr>
<td>Actors</td>
<td>Agent Tutee, Agent Matchmaker, Agent Tutor</td>
</tr>
<tr>
<td>Assumptions</td>
<td>The tutee is satisfied with the answers discussed in the community.</td>
</tr>
<tr>
<td>Description</td>
<td>The rounded up discussion is archived by the Agent Tutee, the Agent Matchmaker, and the Agent Tutor.</td>
</tr>
<tr>
<td>Exceptions</td>
<td>NA</td>
</tr>
<tr>
<td>Results</td>
<td>The rounded up discussion is added to the LN and available through the Agent Tutee, the Agent Matchmaker, and the Agent Tutor.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Rate tutor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary</td>
<td>The tutee indicates his impression of the tutor’s suitability by providing a rating.</td>
</tr>
<tr>
<td>Actors</td>
<td>Tutee, Agent Tutee, Agent Tutor</td>
</tr>
<tr>
<td>Assumptions</td>
<td>The community is created and populated with tutee and tutors and discussion has taken place.</td>
</tr>
<tr>
<td>Description</td>
<td>The tutee indicates his impression of the tutor’s suitability by providing a rating. This is stored both in tutee’s and tutor’s dossier by the tutee and tutor agents.</td>
</tr>
<tr>
<td>Exceptions</td>
<td>No rating is provided.</td>
</tr>
<tr>
<td>Results</td>
<td>The rating can be accessed by tutor and tutee. The rating can be taken into account when computing tutor competence and eligibility.</td>
</tr>
</tbody>
</table>
### Round up discussion

<table>
<thead>
<tr>
<th>Name</th>
<th>Round up discussion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary</td>
<td>The tutee rounds up the discussion when his/her content question is satisfactorily answered.</td>
</tr>
<tr>
<td>Actors</td>
<td>Tutee</td>
</tr>
<tr>
<td>Assumptions</td>
<td>The tutee asked a content question and received at least one answer to this content question.</td>
</tr>
<tr>
<td>Description</td>
<td>In the community the content question and its answers are discussed by the tutee(s) and the tutor(s). When the tutee decides that the question is satisfactorily answered he closes the discussion. The system acts upon this decision signalling it to the archiving process.</td>
</tr>
<tr>
<td>Exceptions</td>
<td>NA</td>
</tr>
<tr>
<td>Results</td>
<td>A rounded up discussion is signalled by the system.</td>
</tr>
</tbody>
</table>

### Update dossier

<table>
<thead>
<tr>
<th>Name</th>
<th>Update dossier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary</td>
<td>The LNU updates his/her electronic portfolio and the system updates the dossier/electronic portfolio.</td>
</tr>
<tr>
<td>Actors</td>
<td>LNU, LNU Agent</td>
</tr>
<tr>
<td>Assumptions</td>
<td>The LNU is logged in the LN and his/her electronic portfolio/dossier is available.</td>
</tr>
<tr>
<td>Description</td>
<td>The LNU accesses his/her electronic portfolio, checks it and updates it. The system automatically updates the dossier/portfolio with regard to study progress (= completed ANs) and data related to tutor competence and eligibility (e.g. rating scores).</td>
</tr>
<tr>
<td>Exceptions</td>
<td>NA</td>
</tr>
<tr>
<td>Results</td>
<td>The electronic portfolio/dossier of the LNU is updated.</td>
</tr>
</tbody>
</table>
Appendix O Class diagram

The entities in the diagram are a mix of dynamic actors and more static data objects. Association classes indicate associations that are performed by the agents or LSA Engine. The association classes indicate several roles the agents take on or the LSA Engine has to perform. In fact, the specialisations are methods of the super class. Directions of associations and multiplicity are not yet indicated in the diagram. Processes like rating of contribution and tutor are not depicted.
LearningNetwork
The LearningNetwork comprises actors (LNU, LNUAgent and MatchmakerAgent) and a set of Activity Nodes that contain documents.

a. LearningNetwork > Documentspace
   The documents in the Learning Network provide the document space for the LSA Engine.
b. LearningNetwork > LNU
   The LNUs (learning network users) form part of the LearningNetwork.

c. LearningNetwork > ActivityNode
   The ActivityNodes form part of the LearningNetwork.

**ActivityNode**

The ActivityNode contains the documents that comprise the unit of learning. The set of ActivityNodes form part of the LearningNetwork.

a. LearningNetwork > ActivityNode
   The ActivityNodes form part of the LearningNetwork.

b. ActivityNode > Document
   The ActivityNode contains documents detailing the unit of learning (activity description and resources).

**Document**

The Documents form part of the ActivityNode. Request, portfolio (Dossier) and PossibleAnswer also are Documents. Documents form the input and query DocumentSpace that is required for the LSAEngine, as well as the output from the LSAEngine.

a. ActivityNode > Document
   The ActivityNode contains documents detailing the unit of learning (activity description and resources).

b. Document > DocumentSpace
   The Documents from the ActivityNodes and Dossier form the input DocumentSpace for the LSAEngine.
   The Request is a Document that is queried on the DocumentSpace.
   The PossibleAnswer is a Document that is retrieved from the AN input DocumentSpace.

c. Document > PossibleAnswer
   The LSAEngine retrieves Documents as PossibleAnswers from the DocumentSpace.

**DocumentSpace**

The Documents in the LearningNetwork (from ANs, portfolio and request) form the input and query DocumentSpace for the LSAEngine as well as the output from the LSAEngine in the form of PossibleAnswers.

a. ActivityNode > Document
   The ActivityNode contains documents detailing the unit of learning (activity description and resources).

b. Document > DocumentSpace
   The Documents from the ActivityNodes form the DocumentSpace for the LSAEngine.

**LNU**

The population of a Learning Network consists of Learning Network Users (LNUs). Every LNU has a personal LNUAgent to assist the user with various actions and
functions in the LearningNetwork. Personal data and progress information of a LNU are stored in a Dossier.

a. LNU > Request
The LNU puts forward a request, i.e. a question that needs answering.

b. LNU > LNUAgent
Every LNU has a personal LNUAgent that assists and represents the user. Several of the LNU actions are conducted via the LNUAgent, although the LNU might not be aware of this.

c. LNU > Dossier
Personal data and progress information are stored in a Dossier. The LNUAgent is responsible for keeping the Dossier up to date, although both the LNU (personal data and portfolio) and the system (progress information, completion of ActivityNodes, etc) can add to the Dossier.

**LNU Agents**
Each LNU has an LNUAgent that represents and assists the user in the LearningNetwork. The LNU Agent has at least 4 functions.

1. NegotiateValidity
   a. LNU > Request
      The NegotiateValidity negotiates the formal validity of the request with the LNU and subsequently sends it to the LSA Engine.
   b. NegotiateValidity > Matchmaker Agent.
      NegotiateValidity sends the request to the Matchmaker Agent for placement in the community.

2. UpdateDossier
   a. LNU > Dossier
      UpdateDossier keeps track of the LNU's dossier information.

3. SendTutorDossier
   a. SendTutorDossier > Matchmaker Agent
      FindTutor provides the Matchmaker Agent with specific dossier details of the LNU.

4. RecordParticipation
   a. LNU > Community
      RecordParticipation records behaviour and participation of the LNU in the Community. This information can be used to determine tutor competency.

**Dossier**
Personal data and progress information are stored in a Dossier. Portfolio data can be present in the dossier.

a. LNU > Dossier
   UpdateDossier keeps track of the LNU’s dossier information.

b. Dossier > MatchmakerAgent
   The MatchmakerAgent asks the LNUAgent to provide the tutor competence data from the LNU’s Dossier.

**Request**
A request refers to a request for support (e.g. a content related question) of the LNU to the peer LNUs.
   a. LNU > Request
      A LNU formulates a Request for support.

**LSAEngine**

The LSAEngine is responsible for mapping a Request onto the Documentspace of the LearningNetwork to find relevant source ANs and to query the Documentspace for PossibleAnswers.

1. **MapRequestOnAN**
   a. NegotiateValidity > MapRequestOnAN
      NegotiateValidity forwards formally valid requests to MapRequestOnAN.
   b. MapRequestOnAN > Request
      MapRequestOnAN receives a request and determines the most relevant AN to which this request belongs in the Learning Network.
   c. MapRequestOnAN > Matchmaker Agent
      MapRequestOnAN sends the most relevant ANs to the Matchmaker Agent.

2. **Query**
   a. Query > Possible Answer
      Query performs a query with the request on the document space to find possible answers to this request.
   b. Query > Matchmaker Agent
      Query sends the possible answers to the Agent Matchmaker for placement in the community.

**Matchmaker Agent**

The Matchmaker Agent is responsible for filling the community with content and for populating the community with actors.

1. **Matchmaker Agent**
   a. Matchmaker Agent > Community (Request)
      The Matchmaker Agent places the formally valid request in the community.
   b. Matchmaker Agent > Community (Possible answer)
      The Matchmaker Agent places the Possible Answer(s) in the community.

2. **PopulateCommunity**
   a. PopulateCommunity > LNU Agent
      PopulateCommunity maps the specific LNU dossier (i.e. ANs) with the request ANs and asks the LNUAgent to invite the LNU to the community as a peer tutor.
   b. PopulateCommunity > LNU Agent
      PopulateCommunity grants access, through the LNUAgent, to the LNU that poses the request to the community as tutee.

**PossibleAnswer**

The PossibleAnswer is the result or output of the LSAEngine when querying the Request onto the DocumentsSpace and consists of (shreds of) relevant documents.

   a. PossibleAnswer > Query
The PossibleAnswer is the output of the LSAEngine when querying the Request onto the DocumentSpace to find documents from ActivityNodes that might represent possible answers.

b. PossibleAnswer > Matchmaker agent
Query sends PossibleAnswers to the MatchmakerAgent.

c. PossibleAnswer > Community
The PossibleAnswer forms input for the Community.

Community
The Community is comprised of LNUs both in a tutor role and in a tutee role and contains PossibleAnswers. The Community has as function to compile an Answer to the Request on the basis of the PossibleAnswer.

a. Community > LNUAgent
The Community is populated with LNUs via PopulateCommunity and LNUAgent with the tutee and a set of, at least one, tutors.

b. Community > MatchmakerAgent {only valid request}
The MatchmakerAgent places a valid Request into the Community.

c. Community > MatchmakerAgent {send possible answers}
The MatchmakerAgents places PossibleAnswers into the Community to be discussed by the LNUs.

d. Community > FAQ Items
The Community generates the FAQItems.

FAQ Item
A FAQItem is formed when a request is successfully answered by storing request and answer.

a. FAQItem > Community
The FAQ Item is the output of the Community.