The e-Career project takes place in the context of the CEN/ISSS Workshop on ICT Skills from 03/2008 to 06/2009. The Project aim is to provide;

- a multistakeholder agreed model for interoperability of e-Skills and ICT Career related websites in Europe,
- recommendations and guidelines for website managers and developers on political, functional and technical levels.

Final outcomes are planned to be published as CEN Workshop Agreement (CEN) in May 2009. This interim report is provided within the CEN / ISSS project progress monitoring process. It is also addressed to stakeholders and experts beyond the workshop community, interested in the work in progress from multiple perspectives. Sections of the report are targeted at specific audiences, they explain the overall European scenario, main project aims, working methods, project progress and initial outcomes.

The report is presented by the CEN nominated expert team
Wilfried Berlin, Jutta Breyer, Terry Hook, Clementina Marinoni, Paolo Locatelli, Marc Robichon.

It is guided by the input and views of the Pilot-experimental Network of Stakeholders (PEN) and the CEN / ISSS Workshop Community.

Interim report draft circulation in the CEN/ISSS Workshop Community: 10 November 2008
Delivery Interim report, updated according to stakeholder comments received: 28 November 2008
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          B – Technical checklist examples : a) iProfile UK, b) German Occuprofiler (Skillsnet)
          C – Use case example
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1. INTRODUCTION – EUROPEAN SCENARIO AND PROJECT AIMS

1.1. ICT Career and e-Skills websites and services in Europe

The volume and diversity of Information and Communication Technologies (ICT) career and e-Skills development websites found and hosted on local, national, European and International levels by organisations, companies and institutions is unsurprisingly huge. Some websites encourage young people to choose an ICT career, others provide advanced ICT career and job guidance. Some sites support qualification and certification promotion others assessment tools or job opportunities whilst others focus on statistical data and sector policies or simply provide space for interaction between sector players. In recent years, a broad range of initiatives have been launched at local and international levels. These include e.g. Europass, the former Career Space, the e-Skills ILB Industry Leadership Board and the recently launched “e-Skills Europe” pilot portal or Cedefop portals at a European level, as well as e-Skills UK, Kibnet, Passinformatique and Cigref portals in local or national environments.

However, navigating through the web and identifying relevant links is difficult as website information about ICT careers and e-Skills development are structured and presented in many different ways. Nevertheless ICT operates in a global market and differences between jobs, methods, competence requirements and solutions are becoming less. ICT supply and demand companies need staff able to develop and manage ICT devices, to understand, build and integrate technology into business processes to leverage productivity and innovation. Consequently, a long term strategy to create, manage, plan and develop ICT competences needed in a long term perspective across Europe, has just become a European objective.

In this scenario, services aimed to help the labour market understand jobs, learning and career advancement opportunities in the ICT field are increasingly relevant. From a European perspective and also from national and regional perspectives, online ICT Career services would be more efficient and benefit end-users if key services were interconnected. Existing websites and portals could provide clearer, transparent, effective and complete ICT career development information and services to individuals, companies and institutions involved in ICT processes (business, learning, career). Service examples include self-assessment, job search, Job-CV matching, career orientation, competences, qualifications or certifications specifically addressed to ICT. The ability to connect these services in a transnational environment would increase their value and efficiency to end-users.

In the past the lack of Europe-wide shared frameworks and tools made connection and integration very difficult, however, common reference standards such as the European e-Competence Framework and the EQF are now available. Together with a European ICT Qualifications Framework they can support interoperability of e-career related websites and contribute to increasing the efficient data exchange of ICT Human Resources development concepts, offers and products across EU member states.
1.2. Towards a shared European online platform: The European e-Skills Portal

The need for a European portal was driven by the significant influence of Information and Communication Technologies on the EU economy, the international competitiveness of the sector and the existence of e-skills gaps in Europe. The provision of a shared European internet platform for e-Skills development is intended to support a wide range of ICT sector players and career seekers.

Following a feasibility study of a European ICT Career Portal carried out in 2007, the European e-Skills and Career Portal project was initiated and supported by the e-Skills Industry Leadership Board (ILB). The ILB and the European Schoolnet service provider launched a pilot version of the portal for the European e-Skills Conference 2008 in Thessaloniki.

The strategic goal of the pilot Portal is to lay the foundations for medium to long term development of market-relevant e-Skills capacity. In addition it addresses tactical activities in support of ICT job seekers and ICT career development. The priority focus group for the pilot phase is students and ICT professionals. The portal functions are dedicated to ICT career guidance, e-Skills information and networking facilities.

In the longer term, the European e-Skills Portal aims to meet the needs of all ICT sector players engaged in European ICT workforce development processes from multiple perspectives. The future target group includes;

- **Individuals**, e-citizen users, students, ICT workers or ICT professionals, the Portal should serve as a ‘one-stop-shop’ for e-Skills and Career Guidance,
- **Employers**, to support the attraction of people into ICT careers, to serve as a point of communication with potential employees / interns and to offer current information on e-Skills jobs,
- **Educators and trainers**, providing them with a platform for providing appropriate guidance to students / trainees about careers in ICT and further training,
- **Government, non-Government and third party stakeholders**, by offering a source for statistical and survey data, promoting ICT skills awareness raising campaigns and policy, providing an overview of the supply and the demand for skills and monitoring educational provision,
- **Job and Employment Agencies**, providing them a source for potential candidates,
- **ICT skills providers**, raising public awareness of the role of non-formal training and educational channels to provide market-relevant ICT skills through multi-stakeholder partnerships, promoting skills programmes, career options and education programmes and tools, enabling promotion or sponsorship of specific initiatives within the Portal community.¹

To achieve a sustainable, added value European online platform deploying feasible resources; interoperability of relevant websites on national and European levels is essential. Interoperability means the ability of Information and Communication Technology (ICT) systems and of the business

¹ See: http://eskills.eun.org/web/guest/objectives
processes they support to exchange data and to enable the sharing of information and knowledge. Commonly established concepts and references, such as the European e-Competence Framework, provide the high-quality neutral standards to support this aim.

1.3. Promoting beneficial data exchange: The European e-Competence Framework and additional facilitators for interoperability between existing and future services

The European e-Competence Framework (e-CF) has been developed by multi-stakeholder, ICT and human resources experts on multiple levels in the context of the CEN ISSS workshop on ICT Skills. The framework version 1.0 was made available for ICT sector use early October 2008. Structured from four dimensions, the e-CF provides for the first time a common European standard reference for communicating ICT competence needs in a Transnational and European environment.

The European e-Competence Framework consists of 32 defined ICT practitioner and manager competences as required and applied in the workplace. The framework can be used and understood by ICT user and supply companies, ICT specialists, managers and HR departments, the public sector, and educational and social partners across Europe. In this sense the European e-Competence Framework provides the first European standard vocabulary articulating e-Skills requirements of the supply and demand side of the European ICT sector through the identification of explicit knowledge and skills.

The ICT Lane initiative, linking ICT Qualifications to the European e-Competence Framework and starting from the EQF, was developed in parallel. In conjunction with the e-CF, ICT Lane may offer the key to European interoperability. These sector-specific interpretations of the EQF emanating from workplace and qualification environments provide key references for an interoperable model to be developed in the e-Career project.

1.4. Developing functional and technical guidelines for e-Skills website in Europe: overall aims and targets of the e-Career project

To increase efficiency and quality for end-users of ICT career services online in Europe, the primary objectives of the e-Career project are to develop and articulate:

- A multistakeholder agreed overview model for interoperability of ICT e-Career services (services found online which support continuous professional development) in Europe
- A multistakeholder agreed competence/qualification connection standard which is the basis for interoperability of various ICT HR key services found online

The project aims to provide answers and guidance on how to improve interconnections and beneficial relationships between ICT HR domain websites and portals which are currently fragmented and dispersed.

\[\text{IDABC-EIF 2004}\]
To produce implementable results for all dimensions of interoperability, the e-Career project addresses three levels:

- **The political / multistakeholder level**: To develop the interoperable model, the ICT Human Resources domain needs to be described by identifying key components and the relationships between them. Descriptions have cultural implications and can be segmented in many ways. To ensure a “European view” of the ICT HR domain reflecting both business and educational culture, it is necessary to involve key stakeholders within the project work.

- **The functional level**: To create value chains, determining which elements should be connected to what and why. Identifying which interoperable functions should be offered to the end-user. To achieve this, guidelines for interoperability initially focused on the functionality offered to the end-user through the website user interface.

- **The technical level**: To provide recommendations for the adoption of technical standards and specifications which will provide technical guidance to website developers and IS architects.

On all three levels, the e-Career project work is guided by these two key questions:

1. Which elements and e-Career services found online are relevant for the e-skills development and careers development of ICT practitioners?
2. To achieve value chains of e-Career services, what can be linked to what and how?

The project team is cataloging current relevant services provided by the internet to key target groups, e.g. students and ICT professionals, companies, social partners, training and certification bodies and recruitment agencies. Logical and beneficial links between services are being identified. Building on the European e-Competence Framework and an ICT Qualifications Framework (both based on the EQF) the project is elaborating strategic, functional and technical recommendations on how to interconnect ICT career web services in a European environment. The recommendations will include:

- The multistakeholder agreed model for interoperability of ICT e-Career services (services found online which help people grow in their career development) in Europe, consisting of:
  - a “helicopter view” schematic of the human resources domain in the ICT field, its relevant e-Career development services provided to key target groups
  - recommended strategic and functional standard specifications for interoperability between existing as well as future portals and the forthcoming European e-Skills and Career portal
  - a competence / qualifications connecting translation standard for ICT qualification contents, enabling linkage between learning outcomes and e-competences
To achieve broader consensus in the European ICT sector environment, the involvement of a broad range of stakeholders is part of the working philosophy and strategy. The CEN e-Career project team is therefore actively supported by the pilot-experimental network of stakeholders (PEN), a community of European ICT career and online services experts who are interested and willing to validate, test and exploit interoperable e-Career Services in Europe.

The recommendations for European ICT Career website developers, designers and IS architects are planned to be published as a CWA (CEN Workshop Agreement) by May 2009.

2. WORK PROGRAMME AND PROJECT PLANNING

2.1. The project plan 2008/09: aims, scheduling and steps completed so far

As a first step of the work started in March 2008, the experts nominated by CEN agreed on a project plan, determining the key steps, the respective timeline, the resources involved and key responsibilities for lead management. This plan was presented and discussed with the CEN/ISSSS steering committee and the ICT Skills Workshop community in May.

The plan has been adopted as the road map for the project to date and, if necessary, will be readjusted according to the ongoing work. Table 2 shows the project Gantt. Table 3 provides an overview on the latest iteration of the project plan and progress achieved so far, and table 1 below the legend for reading the project plan.

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<tr>
<th>Project plan “Interoperability of European e-Career services” 2008/09 - legend</th>
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<td>CM – Clementina Marinoni (methodological leading)</td>
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<td>MR – Marc Robichon (ensuring the qualification and certification providing perspective)</td>
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<td>PEN = Pilot experimental Network of Stakeholders (s.3.3.)</td>
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<td>WIP = Work in progress</td>
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Table 1: The e-Career project plan 2008 – 2009 (Legend)

Project progress – Forthcoming outcomes on recommendations/ guidelines for Interoperability of European e-Career services in the ICT field both on functional and technical level – will be explained in detail in part 4 of this report.
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<th>Work steps</th>
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<tr>
<td>13</td>
<td>• Development of the final version of the interoperable model</td>
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<td>14</td>
<td>• Preparing and delivering the final CWA</td>
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</table>

Table 2: The e-Career project plan 2008 – 2009 (Gantt)
Table 3: The e-Career project plan 2008 – 2009 in detail

<table>
<thead>
<tr>
<th>Work steps</th>
<th>Timing</th>
<th>Activities/ tasks</th>
<th>Working methods, meeting dates</th>
<th>Resp. experts</th>
<th>Further stakeholders involved</th>
<th>Links/ input needed</th>
<th>Outputs</th>
<th>WIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>03/08 – 04/08</td>
<td>• establishing the project team</td>
<td>• exchange by mail and phone</td>
<td>JB, CM</td>
<td></td>
<td>• European e-Competence Framework(e-CF)</td>
<td>• CEN expert team and working structures</td>
<td>ok</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• development and agreement work programme, project plan and structure</td>
<td>• Project team conf call 30/4</td>
<td></td>
<td></td>
<td>• EQF</td>
<td>• detailed project plan</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• first decisions on project underpinning methodology</td>
<td></td>
<td></td>
<td></td>
<td>• ICT Lane outcomes</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td>• Europass</td>
<td></td>
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<tr>
<td>2</td>
<td>04/08 – 06/08</td>
<td>• HR domain formalisation with its possible interoperable services</td>
<td>• first suggestion by CM, PL, further development by project team</td>
<td>CM</td>
<td></td>
<td>• Project proposal</td>
<td>• General model of HR domain formalisation with possible interoperable</td>
<td>ok</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• CEN project team meeting 13/5 Paris</td>
<td></td>
<td></td>
<td></td>
<td>services as a starting point</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>• CEN SC (13/5) + Plenary (14/5) meeting Paris</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>3</td>
<td>04/08 – 05/08</td>
<td>• Detailed project plan for technological issues</td>
<td>• CEN project team meeting 13/5 Paris</td>
<td>PL</td>
<td></td>
<td>• Detailed plan for the technical development</td>
<td></td>
<td>ok</td>
</tr>
<tr>
<td>4</td>
<td>05/08 – 08/08</td>
<td>• State of the art analysis: - e-Career Services really available - their level of standardisation - their technological features</td>
<td>• Sifting documentation already available</td>
<td>TH, MR, PL, WB, CM</td>
<td></td>
<td>• PAU Feasibility Study</td>
<td>• State-of-the-art: Overview on e-Career services available, their levels of standardisation and technological features</td>
<td>ok</td>
</tr>
<tr>
<td>Work steps</td>
<td>Timing</td>
<td>Activities/ tasks</td>
<td>Working methods, meeting dates</td>
<td>Resp. experts</td>
<td>Further stakeholders involved</td>
<td>Links/ input needed</td>
<td>Outputs</td>
<td>WIP</td>
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</tr>
<tr>
<td>5</td>
<td>05/08 – 10/08</td>
<td>Establishing the Pilot Experimental Network of Stakeholders (PEN)</td>
<td>• “Call for a pilot experimental network”: PEN meeting 19/06 Brussels</td>
<td>JB</td>
<td>• CEN plenary</td>
<td>• EUN/ e-Skills ILB</td>
<td>• Interested website stakeholders in EU</td>
<td>ok</td>
</tr>
</tbody>
</table>
| 6          | 06/08 – 09/08 | Identification of existing relevant and useful e-Career Services within the HR domain model, in order to develop the ontology-based interoperable model | • Requirement analysis in view of different target groups (industry, qualification environment, individuals)  
• Interpretation of outcomes collected in step 4 | all           | • State of the art analysis results                                               | • Concrete reference model for HR domain formalisation with aspired interoperable services (draft) | ok  |
| 7          | 10/08     | Presentation of the concrete reference model draft to stakeholder public  
Collection of feedback                                                                 | • CEN project team meeting 29/10 Milano  
• PEN meeting in 30/10 Milano | CM, JB        | • European e-Skills and Career Portal pilot version                              | • Improved concrete reference model according to feedback received by stakeholders | ok  |
| 8          | 10/08 – 11/08 | Editing Interim Report - Draft CWA for CEN Plenary discussion and further development according to wip | • Draft by CEN project team  
• Integration of feedback received by CEN Plenary | JB, TH, CM    | • Readjusted concrete reference model  
• First version of the interoperable model  
• The competences / qualifications standard wip | • Interim report preparing the draft CWA | WIP |
<table>
<thead>
<tr>
<th>Work steps</th>
<th>Timing</th>
<th>Activities/ tasks</th>
<th>Working methods, meeting dates</th>
<th>Resp. experts</th>
<th>Further stakeholders involved</th>
<th>Links/ input needed</th>
<th>Outputs</th>
<th>WIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>10/08 – 11/08</td>
<td>• Adjustment of the concrete reference model according to feedback received final agreement</td>
<td>all</td>
<td>PEN</td>
<td>• Feedback received in step 7</td>
<td>• Readjusted concrete reference model agreed by stakeholders involved</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>07/08 – 05/09</td>
<td>• Development of the interoperable model (technical and functional features, translation)</td>
<td>TH, MR, PL</td>
<td></td>
<td>• The readjusted reference model</td>
<td>• First version of the interoperable model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>07/08 – 05/09</td>
<td>• Development of the competences / qualifications connection standard</td>
<td>CEN team meeting in 02/08</td>
<td>MR, CM</td>
<td>• ICT Lane translation standard model</td>
<td>• The competences / qualifications standard model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>02/09</td>
<td>• Exchange and discussion “in presence” with stakeholders on the first version of the interoperable model</td>
<td>PEN Meeting in 02/08</td>
<td>JB, CM, PL</td>
<td>• First version of the interoperable model</td>
<td>• Feedback on the first version of the interoperable model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>03/09 – 05/09</td>
<td>• Development of the final version of the interoperable model</td>
<td></td>
<td>PL, CM</td>
<td>• European e-Skills and Career Portal current developments</td>
<td>• Interoperable model – final version</td>
<td></td>
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</tr>
<tr>
<td>14</td>
<td>04/09 – 05/09</td>
<td>• Preparing the final CWA</td>
<td></td>
<td>JB, TH, CM</td>
<td>PEN, CEN Plenary</td>
<td>• Final CWA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: The e-Career project plan 2008 – 2009 in detail
2.2. Main steps of work

2.2.1. A starting point: HR domain formalisation with possible interoperable services

The landscape of HR ICT website services across Europe is very diverse and at first sight each appears disconnected and unrelated. To facilitate better understanding of current service provision in this environment the project sets out to identify and characterise existing HR ICT services.

Figure 2 in chapter 4.1 illustrates the fundamental schematic used as the project orientation map; it provides an overview of the main e-career services to be investigated. During the course of the project this schematic was to be continuously updated based upon new knowledge and feedback obtained.

It was known from the outset that the original model was incomplete and subject to constant revision; this being the essence of the project to expand and define the components of the model and understand existing linkages. Starting from a position of relative ignorance about the current state of services provision and interoperability, the project planned to gain knowledge on current status to provide the basis for recommendations on the ideal state and how to achieve it.

2.2.2. State-of-the-art analysis of existing ICT Career websites

In order to define an interoperability model for existing and future e-Career service portals in Europe, it is necessary to analyse representative examples of existing ICT career portals on local, national and European levels and their associated services at functional and technical levels. This includes data level, presentation level and application level.

This survey needed to be qualitative rather than quantitative: It is neither meaningful nor feasible to analyse the vast number of existing portals across Europe. It was more efficient to choose representative examples covering different website business models and target groups including national and European examples. Analysing the representative websites provided an insight into the most used interconnections. This helps to understand the future needs for interoperability.

A survey was built using the Human Resources domain model “helicopter view”, and the target audiences were people (novices, professional and end users), companies, recruitment agencies (public or private), training bodies (public or private), certification bodies (public or private) and trade-unions (including professional bodies). The applied methodology was to investigate the services from the perspective of the different target groups, by listing the services that could be of value to the target groups.

Specific elements and services from the HR domain model were identified, e.g. Candidate’s curriculum/ portfolio, Internal/ external job posting, Diagnostic assessment. Learning/ development programs, Learning modules/resources, Training programs, Formative assessment, Certification programs, Summative Assessment for certification, Market and Career Scenarios, Company
profiles and competences (internal frameworks), Internal assessment, Project activities, Business processes/ work activities, European e-Competence Framework and ICT Qualifications Framework.

For each service and at the functional and technical levels, the websites managers were asked to provide samples of services, to indicate the degree of relevance of interoperability, and to explain their technical choice.

Websites were analysed namely from the public sector, industry, sector associations, certification and recruitment service providers, sites coming from Germany, France, Italy, UK and European level. How the outcomes of the analysis phase are influencing the forthcoming interoperable model is explained in detail in chapter 4.3.

2.2.3. Engaging the pilot-experimental network of stakeholders (PEN)

The e-Career project aims to describe the Human Resources domain of the European ICT sector by identifying and defining key elements (objects) and beneficial existing or future relationships between them. This formalised representation of reality – known as “ontology” – must be based on common agreement on how to structure related characteristics. How the ontology is built can be influenced by cultural views and elaborated in many ways. To achieve and to ensure a European view of the ICT HR domain reflecting both business and educational environments, it is necessary to involve key stakeholders in the project.

A key issue for the e-Career project methodology and for future success is to establish and engage a Pilot-experimental Network of Stakeholders (PEN) in the ongoing project work. The PEN is able to validate the model and is willing to exploit interoperable e-Career Services.

2.2.4. The ICT Human Resources domain: Developing a clear and beneficial “HR helicopter view”

Taking the HR Domain model, which was presented in the project proposal in November 2007, as a starting point (s.4.1.) for continuous improvement of the European ICT Human Resources domain “helicopter view” with associated relevant services and interconnections, underpins project progress. The illustration of outcomes achieved so far, displayed in chapter 4, shows how the HR helicopter view is continuously reviewed and optimised according to research results from work carried out by the CEN expert project team and PEN stakeholder as well as the CEN ISSS community discussion.

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3 The entire list of websites analysed can be seen in section 7 of this interim report. Technical and functional analysis examples are included in the Interim report annex.

4 A list of companies and institutions involved in the Pilot-experimental Network of Stakeholders to date is provided in section 7 of this interim report.
2.2.5. Addressing ICT competence demand and qualification supply: The competence/qualification connection standard

e-Career services are often based on “competences” or “learning outcomes”. If for instance, we take diagnostic assessments or summative assessments, curricula and job profiles, job posting or certifications, all of these services relate to competence models/ definitions/ descriptions. If we take qualifications, learning and training programmes, formative assessment, learning modules and summative assessments, they relate to “learning outcome” specifications.

Consequently, if we want to connect, for example, assessments to qualifications, summative assessments to curricula, curricula to qualifications, and so on, we need a common language to base these connections. To connect competences to learning outcomes, they need to be expressed in the same way using the same vocabulary. The European e-Competence Framework and ICT Lane projects, both aligned to EQF, provide compliant definitions of competence and learning outcomes.

To provide a key enabler for interoperability, a competence/ qualification connection standard will be developed during the second half of the e-Career project. It will be based upon European definitions of competences, knowledge and skills defined by the e-CF and EQF. In paragraph 5.2. an outlook of the prospective connection standard model is provided.

2.2.6. Establishing the interoperable model and related recommendations for Interoperability of European e-Career services

Having established the original HR services domain model there was a need to populate it with the ‘state of the art’ existing web services. To support the necessary research activities the project team needed to ensure a consistent approach to analysing target websites. The concept applied was to use an ontology based methodology and apply this in a standard set of questionnaires. Functional and technical information could then be collected and analysed to establish current interoperability standards in use.

An updated model could be populated with current information, gained from research, and this would facilitate analysis from several perspectives including target groups or service types. Detailed analysis could then be conducted on commonly provided services and existing levels of interoperability. Furthermore ideas could be developed on where to focus recommendations for improved interoperability based on a thorough understanding of the existing status of HR domain sites. This can then be supplemented with recommended courses of action to address how improved interoperability in a European and Transnational environment can be achieved from political, functional and technical viewpoints.
3. **WORK PERFORMANCE IN 2008**

3.1. **Working structure, experts and stakeholders involved**

In March 2008, a group of six experts financed by CEN, started methodological and operational work on the interoperable model. These experts are supported on technical and political level by a larger community.

![Diagram showing the working structure of the CEN nominated e-Career project team and the PEN Pilot-experimental Network of stakeholders](image)

The Pilot-experimental Network of stakeholders (PEN) consists of the CEN experts and further interested representatives from European ICT stakeholders and Industry. The PEN community are very valuable and essential to enlarging the CEN expert's perspective. They analyse and discuss the CEN experts input on project progress and provide the foundation for multistakeholder discussion and further consolidation of project outcomes in the CEN ISSS Workshop on ICT Skills.

The technical and political work progress towards the CEN Workshop Agreement (CWA) “Interoperability of e-Skills and ICT career services in Europe” is supported and monitored by the CEN/ISSS workshop community on ICT Skills. The CEN/ISSS Steering Committee supervises the project work and the final results are to be agreed, approved and communicated by the CWA to be published in May 2009. The combined knowledge of ICT qualification and Human resources development requirements across Europe represented by the CEN/ISSS Workshop community provides an invaluable background for the project work.

3.2. **Expert work carried out by the CEN e-Career team**

The expert work carried out by the CEN nominated team focuses on all operational steps as described in the work programme in chapter 2 of this report. The combined expertise of the multi disciplinary team provides the necessary basis to bring forward the work on political, functional and technical level in a European multistakeholder ICT sector environment.
3.3.  Project milestones: The PEN meetings

The meetings of the Pilot-experimental Network of stakeholders (PEN) are considered as project milestones and are essential components of work progress. The three planned PEN meetings are proceeded by CEN expert team meetings where the CEN nominated experts review and agree work achievements to date. This agreement provides the input for the following meeting of the Pilot-experimental Network of stakeholders where interim achievements are further discussed and optimised, providing a multistakeholder consensus for the following work steps.

3.3.1.  Kick-off PEN meeting in Brussels 06/08

The PEN meeting in Brussels in June 2008 was the kick-off meeting of the Pilot experimental Network of stakeholders. Main meeting aims were

- to build a European community of stakeholders who were willing to use and exploit together interoperable eCareer Services,
- to share the main project aims and stakeholder needs
- to investigate the key question “Which elements (found online) are relevant for ICT career and e-Skills development? Which of them should become interoperable?”

The kick-off meeting facilitated the development of a new community, with stakeholders representing different perspectives such as trade unions and employer associations, ICT qualification and certification providers, industry and the public sector from France, Italy, Germany, Austria, Belgium, UK as well as the European level. This multistakeholder working group provided valuable input on how to further develop the HR domain “helicopter view”, based on stakeholders’ feedback and individual views on relevant online services as well as relevance of possible interconnections between them.

3.3.2.  Second PEN meeting in Milano 10/08

The second PEN meeting took place end of October in Milan and enriched the PEN community with additional regional, national and European perspectives, coming e.g. from Norway and further organisations from Italy. The main meeting aims were

- to further develop and to agree on the ICT Human resources domain model in an online environment, implementing the European e-Competence Framework as a core reference (ICT HR domain “helicopter view”)
- to develop and to discuss collaboratively cases for beneficial website/ interoperability use (value chains)
- exploitation of opportunities for (future) website improvements with a view to Europe
The outcome gave crucial input on how to further review and optimise the ICT Human resources domain model, implementing the European e-Competence Framework as a core reference and providing the reference model as presented in chapter 4 of this report. Additionally, the workshop participants developed relevant user cases of possible value chains for future interoperable services in Europe, coming for example from employers’ or an ICT career seekers perspective. An example of such a use case developed in the PEN context is provided in the Interim report annex.

3.3.3. Final PEN meeting planned for 02/09

The final PEN meeting is planned for February 2009. The main aims of the final meeting are to exchange and discuss with the stakeholders in presence on the first version of the interoperable model and to collect feedback and input for developing the final version in view of the CWA to be delivered in April/ May 2009.

3.3.4. The work between the meetings

Whilst the two-day-workshops between CEN experts and the Pilot-experimental Network of stakeholders (PEN) represent observable milestones of the project work, the work between the meetings is also crucial. Each meeting has an intensive follow-up: Here the challenge is to summarise the most important results and to provide and extract synthesis of results acceptable and applicable for all stakeholders involved. The project and methodological lead management provide direction for the further work encompassing next steps and expected outcomes plus preparation of the next meeting. The CEN nominated experts are experienced in virtual communication techniques and maintain contact through e-mail, conference calls, CEN Plenary meetings and, if meaningful and necessary, additional CEN project team meetings.

4. TECHNICAL WORK ON THE INTEROPERABLE MODEL: METHODS, FIRST FINDINGS

4.1. The HR domain formalisation and the ontology-based approach

The Human resources domain formalisation (Figure 2) was taken as starting point for project work and as a solid basis for orientation of the survey and the analysis of existing ICT Career websites.

The model was elaborated during the project proposal development in 2007 and summarises the most relevant components defining the HR domain:

- Target groups: people, companies, training institutions, certification bodies;
• e-Career services: e.g. Individual’s portfolios, Company job postings, Assessment, Certification programmes, Learning - training programmes, Learning resources - modules, materials, etc., Competence and job profiles frameworks;

• Reference business contexts: e.g. Project activities, work processes;

• Possible connections between services.

Figure 2: The Human Resources (HR) domain reference model

This representational model that underlines many of the main HR process components, was an initial, basic “ontology” to be shared among the team and the reference stakeholders as it identifies objects (e-Career services) and possible relations between them (e.g. matching/ association/ requirement/ implication, etc.). As an example, diagnostic assessment of competences can be related to job profile frameworks and to qualifications or certification programmes. Job profile frameworks are a necessary reference to build competence assessments, while competence assessment results can become an input for qualification or certification programmes. Furthermore, these relationships can be simply “informative”, e.g. assessment results provide the necessary information to search certification programmes, or they can be advanced, e.g. assessment results “automatically” identify and match with consistent qualification or certification programmes. By defining these objects and mutual relations, we define an “ontology” for the HR domain.

But what is ontology? Why do we need to formalize the HR domain by ontology? Would it not be enough to use Entity-Relation (E-R) Schemas (i.e. schemas for conceptual representation of structured data and Data Base modelling)?
“Ontologies” provide reference structures; describe domains – pieces of worlds – by identifying and defining the “core” objects inside and relationships between them, in concordance with the domains’ agreeing communities. If the number of objects is limited and their mutual relationships are basic and few, then it is not necessary to formalize them by “ontology”. Entity-Relation Data Bases are enough. However, the more the objects and their relationships are differentiated complex and many, the less the Data Base formalisation is effective. In these cases, ontology-based approaches are required.5

The HR domain represents a high-level complexity context. Relevant relationships between e-Career services are semantic-based and often context dependent. E-curricula, job posting, competence assessments, learning programmes, etc, if mutually connected by high-level interoperable criteria, have to share meanings, not only syntactic rules (e.g. assessment results cannot be related to learning programmes by matching procedures only; they also need their content significances); “reasoning” functions may even be required for advanced interoperable functions.

The ontology-based model presented in figure 3 shows a prospective view of the HR domain’s “supply chain”; a “value chain” conceived more as a circular integrated system than as a linear connection or catenation of services. An E-R schema would not be able to grasp and formalise this “value-creating virtuous circle”.

Another important issue emerges which is that if all services referred to a common language (concept definitions and semantic rules), then building and exploiting mutual interoperable relations would be easier. With respect to this, the competence and job profile frameworks, including standard CV formats, whether national/ European or locally and company-addressed, play a key role (as well as companies’ projects and work processes). In fact, they can be a basic reference for building the other objects-services, such as assessments, learning and certification programmes, job posting, etc, and their connections. Hence, frameworks such as the European e-Competence Framework, the ICT Qualifications Framework and Europass can function as shared reference translators / interpreters within the HR domain.

4.2. Investigating existing websites: Analysis method

On the basis of the representational model shown and described in the previous chapter, two survey grids were elaborated to investigate and analyse existing e-Career service websites.

a) A functional checklist

b) A technical checklist

5 An example on how an ontology can be developed is provided by the TRACE project: http://trace.education-observatories.net
Both grids have listed all the e-Career services identified in the representational model.

The **functional checklist** focuses on the following aspects:

|------------------------|------------------------|-------------------|---------------------|-----------------------------------------------|--------|-------------------------------|-------------|

**Table 4: Functional checklist – Survey guiding criteria**

This functional checklist investigates what kind of e-Career services are implemented in the reference website examples chosen across Europe, for what purposes. The survey focuses on types and levels of interoperability of e-Career services considered, with specific samples.

The **technical checklist** focuses on the following aspects:

<table>
<thead>
<tr>
<th>HR DOMAIN ELEMENT</th>
<th>Element description</th>
<th>List of services of the Portal (please add URL’s)</th>
<th>Standards for interoperability</th>
<th>Semantic formalisation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Presentation level</td>
<td>Data level</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Application level</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Use of portal standards</td>
<td>Use of Data exchange</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(JSR168, WSRP, etc.) - Specify standard version</td>
<td>(XML, XML vertical standards - e.g. HR XML, other standards)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Use of Web Services (WSDL, UDDI, …)</td>
<td>Knowledge represented by ontologies</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Formalisation language (e.g. OWL)</td>
</tr>
</tbody>
</table>

**Table 5: Technical checklist – Survey guiding criteria**

This technical checklist investigates what kinds of technologies have been used to implement the e-Career services considered on each website. The more the interoperability between services developed the more the technologies behind are relevant.

The survey was addressed to 18 e-Career services websites that can be classified as following:

- National - sectoral job market place
- Sectoral e-Career portals
- Vocational training service providers
- Recruitment service providers
- Certification service providers
The outcomes of the surveys, collected from the functional and technical contact for each website, were revised and validated by the e-Career services team using online analysis and conducting desktop research on each website.

The functional outcomes of the survey were an input to revise the initial HR domain model. In particular, two views have been elaborated. One view is focused on the existing services and relationships; the other one is focused on their possible developments towards interoperability.

The technical outcomes of the survey are an input to the technical recommendations for the forthcoming interoperable model.

4.2.1. Functional survey

The data analysis coming out of the functional survey was focused on verifying:

a) whether the e-Career services listed in the check list and represented in the initial model are really implemented in the websites analysed,

b) whether and what further e-Career services have been implemented within the websites analysed,

c) whether other target groups emerged beside those ones already identified,

d) what kind of interactions these e-Career services offer to users according to the European classification of e-Government:

- **Information phase - level 1**: presence on the web, providing the users with relevant information. Format of a brochure or leaflet

- **Interaction phase – level 2**: the interaction is stimulated with various applications. People can ask questions via e-mail, use search engines, and download forms and documents

- **Transaction phase – level 3**: the complexity of the technology is increasing, but customer value is also higher. Phase three is made complex because of security and personalisation issues. Services make use of digital signatures and e-procurement applications

- **Transformation phase – level 4**: all information systems are integrated. One single point of contact for all services is the ultimate goal. The complex aspect in reaching this goal is mainly on the internal side, e.g. the necessity to change culture, processes and responsibilities.  

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e) What kind of relationships between services have been implemented in the websites analysed and their level of interoperability.

Concerning e-Government classification and interoperability, full interoperability of systems and services is at level 4 of the e-Government classification described above and not below level 3. Systems mainly at level 4 and in some ways also at level 3 are well integrated.

Based on the results achieved, the HR domain model has been revised. The revised version includes the existing relationships between the implemented e-Career services and an outlook of future interoperable connections. Also possible e-Career services of added value in a European ICT multi-perspective environment for internet end-users have been annotated.

4.2.2. Technical survey

The technical survey was developed with the aim of gathering data which could be relevant to verify:

a) Whether already existent portals had been developed (at service level) following standards which could enable syntactic interoperability among the different services, at three different levels:
   - Presentation level
   - Application level
   - Data level

b) Whether identified services have been formalized on the semantic point of view, by using ontologies and if these ontologies are realised with specific languages

The emerging results have been taken into consideration for the ongoing development of the interoperable model. The results of the survey have shown that most of the e-Career services available today are provided as stand-alone. Acknowledging this, the interoperable model is being built by evaluating what kind of technologies could be provided for each link of the HR domain model and at which layer.

4.3. State of the art in Europe – websites analysis outcomes

The applied methodology was to look at the services from the perspective of different target groups by listing the services by the use which people, companies, training/certification bodies and recruitment agencies could make of them.
Key target group 1: People

Regarding services addressed to people, many of the analysed portals revealed the existence of functions supporting candidates in activities for developing a portfolio of competences. Activities available for candidate’s portfolio are basically distinguished between those related to the possibility to browse and explore job roles by themselves and those which provide forms to insert criteria in on-line banks using a standard format. Services related to diagnostic assessment are available although they are mainly mediated through human evaluation. There are some examples where evaluation is automated and in these cases data are listed in a structured way. In most portals, people make self-assessments by an exploration of knowledge and skills required by professional profiles and match them against their own. The analysis of provided services has created the necessity to add a new cluster of services related to people, which is Market and Career Scenarios: in this area many services provide news and information to address candidates’ careers.

In this field, links for interoperability are provided by a few portals, some of them at presentation level, where portlet standards are used to integrate services coming from other portals into a single entity. Some services are made interoperable at the application level, where WSDL is used to define web services called by portals in order to develop personal learning plans coherent with the assessment completed. Some services use standard ways to represent data related to services with a relevant role of one XML based vertical standard: HR-XML. Only one among the analyzed portals uses ontologies to represent knowledge: in this case ontologies are provided in the form of taxonomies written with OWL and are used to define occupations and to establish skills gaps.

Key target group 2: Companies

Looking at portals from a companies’ perspective, many existing services have been established focused upon job posting and internal assessment, only a few could be listed for internal frameworks, project activities and business processes.

Regarding job posting services accessed by companies, some are intended to enable candidates’ to use by directly posting requirements for specific job profiles, either directly on the portal or by

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7 e.g. CompTIA, Kibnet, Monster, e-Skills Europe
8 e.g. ANPE, EADS, Monster, Italialavoro
9 e.g. Germany Occuprofiler’s supervisor review
10 e.g. iProfile’s structured CV evaluation
11 e.g. AICA’s competences assessment based on the EUCIP framework
12 e.g. Italialavoro, e-Skills Europe, ECWT’s news, bulletins, documents, procedures, AICA’s wage confronting service, Passinformatique’s multimedia witnesses
13 e.g. e-Skills Europe
14 e.g. Germany Occuprofiler
15 e.g. iProfile
16 Germany Occuprofiler’s occupational and skills-gap taxonomies
17 e.g. iProfile, ANPE, Monster, Italialavoro
18 E.g. e-Skills UK’s skills gap analysis based on SFIA or assessment based on the National Vocational Framework
19 CompTIA’s structure based on links between skills, critical work functions and certifications related to jobs
20 e.g. Monster
signalling links to specialised job banks\textsuperscript{21}. An example of technical implementation has been found which uses web services (formalized with WSDL) to send postings directly to public job boards\textsuperscript{22}.

Internal assessment can be provided by giving the possibility to companies to make self-assessments of employees, by matching their competences with national frameworks. Only one portal uses semantic interoperability to allow this matching, using ontologies to make the matching easier\textsuperscript{23}.

A few cases of internal frameworks have been found, where standard job descriptions are listed under professional areas, allowing companies to evaluate if internal structures are compliant to those listed as reference elements\textsuperscript{24}. Very few examples can be found for competences structured in a way that could allow linkage to project activities or business processes: these examples are not structured with technologies enabling interoperability, but are provided as stand-alone descriptions of job profiles for which required skills, work functions and certifications are listed\textsuperscript{25}.

**Key target group 3: Training Bodies**

Training bodies have interest in evaluation services involving the provision of learning materials and the possibility to link learning paths to previously assessed competences. Services have been explored by understanding how individuals uncover them; this is an interesting aspect for training bodies and could enable them to understand how their services reach the market. Only one portal provides learning paths based on performances evaluated on the job. Other services are given by grouping courses by thematic area or professional profiles. None of the services is interoperable with diagnostic assessment and even the one linked to performances is strictly dependant upon opinions given by human assessors\textsuperscript{26}. Services involving training program provision offer information about how to develop personal training paths, but nothing about structured programs linked to evaluated competences\textsuperscript{27}.

Links for both learning and training programs to learning modules as access to modules are often subject to the identification of a previous learning or training path\textsuperscript{28}. The provision of online learning is achieved either directly or indirectly via alternative websites by linking to e-Learning modules\textsuperscript{29}.

Very few examples of formative assessment have been found. In one portal there is the opportunity to simulate an exam in which people wish to gain certification\textsuperscript{30}.

\begin{itemize}
  \item \textsuperscript{21} e.g. CompTIA
  \item \textsuperscript{22} Germany Occuprofiler
  \item \textsuperscript{23} Germany Occuprofiler
  \item \textsuperscript{24} e.g. Italilavoro’s matching between companies structure and standard job descriptions
  \item \textsuperscript{25} e.g. CompTIA
  \item \textsuperscript{26} Germany Occuprofiler work-based performance learning outcomes
  \item \textsuperscript{27} e.g. Italilavoro’s learning paths linked to security matters
  \item \textsuperscript{28} e.g. e-Skills Europe
  \item \textsuperscript{29} e.g. Learndirect’s direct provision of eLearning
  \item \textsuperscript{30} AICA’s certification exam simulation
\end{itemize}
Few interconnections provide for technical interoperability. The analysis of state of the art underlined the presence of a vertical XML based standard for the management of courses and learning related information (XCRI - eXchanging Course-Related Information) and of platform based on SCORM (Shareable Content Object Reference Model) standard.

**Key target group 4: Certification Bodies**

Services related to certification bodies can be found as certification programs or, more rarely, as summative assessments. Certification bodies have an interest in services to support benchmarking of the existent situation and through analysing provision they could define a strategy to meet future requirements.

Regarding certification programs, many services are provided as lists of certifications that are required by specific job profiles, with links to institutes which could make them available.

Summative assessments services have been sought. They had been defined as services which allow the evaluation of competence and enable the issue of certifications. Only a few services have been found which are compliant to this definition and none of them enable automatic recognition of competences. Self assessment against a standard profile is the most common method deployed.

**Key target group 5: Recruitment**

The target group Recruitment represents players engaged in linking people and company vacancies and also those linking people to training or certification bodies.

As a service, recruitment agencies can work as intermediaries between people and companies identifying the candidate’s curriculum / portfolio, diagnostic assessment and job posting.

Regarding personal profiles, there are many services by which people can make themselves visible to companies by posting a CV to recruitment agencies. Agencies can use tools to extract data from filled-in forms and carry out matching with available positions. These tools can work in an automatic way if they are linked to structured formats. The services are made interoperable at application and data level, thanks to the use, on one side, of standard communication protocols, such as SOAP, on the other side of standard languages certified and compliant to HR-XML (Staffing Exchange Protocol in particular). Semantic formalisation is assured by the use of competency taxonomies.

The process of automatic CV extraction from a structured form aligns with diagnostic assessment, where capabilities are found starting from the features resulting from a pre-formatted form. There is

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31 None of the analyzed portals uses this standard
32 e.g. AICA’s SCORM compliant platform
33 e.g. ANPE, Métiers de l’Internet
34 e.g. CompTIA
35 e.g. Italialavoro
36 e.g. iProfile’s automated CV extraction
only one example of an available service for diagnostic assessment which makes use of competency taxonomies for semantic formalisation.\textsuperscript{37}

An interesting interoperable link has been found between CV extraction and job posting. Recruitment agencies can use an interoperable service to find available job postings after extracting information from standard forms. This kind of interoperability is provided by enabling different actors to feed the same database with information to be shared.\textsuperscript{38}

Other services recruitment agencies could look at are those related to market and career scenarios. Here, their interest could be to find information to better understand trends in job demands and offers, in order to provide a better service level to their customers.\textsuperscript{39}

Finally, agencies could work as intermediaries between individuals and training bodies, by providing services in the field of learning / development programs. In the analysed portals, a governmental initiative providing training initiatives linked to competence has been found, but there is no interoperable link with competences resulting from assessment.\textsuperscript{40}

**Sharing common features: National and European frameworks**

Another perspective has been used to investigate services based on national and European frameworks defining competences or qualifications.

At the current state, services which have links to standard frameworks refer to the local level accessing national occupational standards, or certifications associated to standard job profiles, or they align talent management processes to standard competence frameworks. From the technical point of view, it could be said that the basis for interoperability has been established with links to national frameworks.

### 4.4. Existing and prospective interoperability – the revised HR domain reference model and structure

The analysis of the surveys of each portal has initiated a second revision of the ontology-based HR domain model “helicopter view” based upon survey results.

*The level of ICT career websites’ interoperability across Europe is at present very low.*\textsuperscript{44}

\textsuperscript{37} iProfile’s capabilities searching and matching
\textsuperscript{38} iProfile
\textsuperscript{39} e.g. e-Skills UK, ANPE, AFPA, Passinformatique
\textsuperscript{40} e-Skills UK’s governmental training initiative
\textsuperscript{41} e.g. e-Skills UK’s National Occupational Standards explorer
\textsuperscript{42} e.g. CompTIA, e-Skills Europe
\textsuperscript{43} e.g. Germany Occuprofiler’s alignment to the European e-Competence Framework
\textsuperscript{44} excluding national exceptions such as the United Kingdom
Although there is comprehensive coverage of the HR domain model, individual portals provide only partial information from the entire domain. Therefore users have to shift from one service to another in order to seek an integrated pathway for career development. This leads to incomplete evaluation and only partial understanding of development opportunities. In addition the same information has to be provided in different formats to each site leading to significant inefficiencies. Furthermore, there is a lack of transparency across National websites which limits information provision across Europe and therefore hinders labour mobility.

This project aims to provide guidelines to build an interoperable user-friendly environment enabling easy linkage of services to the benefit of users.

Figure 3 shows an extract of the revised HR domain model which focuses only on common e-Career services, namely the e-Career services usually provided by the websites investigated across Europe in the context of this survey. The figure illustrates also the connections found between them.

Figure 3: e-Career services usually provided by the website typologies investigated
As figure 3 shows, the only type of assessment commonly developed is diagnostic, i.e. self-assessments to evaluate one’s own knowledge and skills. The other types of assessments (e.g. summative or formative) are usually not available on line as most certification and training programmes are not available on line. However if assessments are addressed to competences it is clear that they need work context or high level simulation.

On-line diagnostic assessment services only address knowledge and skills. Moreover, they commonly provide only basic performances (level 2 of e-Government classification – interaction phase as a maximum) and are not automatically connected to other services.

Concerning learning and training programmes, basic interoperable links are normally with learning modules as it is usually possible to access lists of modules required for learning/training programmes. However it is not common to find on line training materials when the programmes are not provided on line. One of the issues under discussion is about services which are open and free and services which are fee based. i.e. “new business models for education” (e.g. “pay per use” and “portal subscriptions”). From an interactive point of view for users, these services range from level 1 – Information to level 2 – Interaction, where documents can be downloaded.

Interoperable e-Career services related to curriculum elaboration, job posting and matching recruitment opportunities are quite common and their level of interaction with users is at level 3 – Transaction. However, Europe is lacking the use of common standards to make it easier to:

a) Understand companies’ needs, qualification titles, and competences developed, hence
b) Identify semantic-based mutual connections, hence
c) Simplify demand and offer formats and
d) Improve e-Career services’ accuracy and effectiveness

Some national portals or portals developed by the contributions of large communities of stakeholders from both private and public institutions (see for example the UK, France, and Italy, in this survey) have implemented competence and job profile frameworks as references for training programmes and certifications. In these cases, they have laid the basis for creating interoperable services.

The HR domain model extract in figure 4 below, represents again the common services and connections as shown in figure 3 and additionally rare e-Career services and connections provided by only some websites investigated in the survey. These at present rather uncommon however very useful services and connections are written and linked in green.
Some websites analysed also gave information on tests used to assess progresses achieved at the end of each learning module. These services are connected to local competences and job profile frameworks and also to learning modules. They are interoperable because we can directly move from the competence framework to information on the related learning programmes / modules and formative assessments. In relation to the European e-Government classification, these services range from level 2 – Interaction, to level 3 – Transaction, when they connect information from different external systems.

With regard to diagnostic assessment services, currently they relate to local / national competence-job profile frameworks and can also refer to training and certification programmes. For them, the e-Government level is 3 – Transaction.

Whether diagnostic, formative or summative assessments, the websites analysed are able to test knowledge and skills. For competences, on-line assessments are limited unless, in the future advanced virtual environments are used.

In relation to companies, some internal services have been developed starting from local/ national competence and job profile frameworks. Some companies merely access them but others also refer to them in order to develop their internal frameworks, organise their internal assessments and training programmes or define and plan their recruitment requirements. These are commonly large companies with experience in career development programmes, competence enhancement,

assessment centres, etc. Nonetheless, interoperability is still not well developed either inside or outside with training or certification institutions and on line recruitment agencies.

In Figure 5, in addition to common and uncommon services and connections found in the websites analysed, the HR domain model is used to enlighten additionally future opportunities for interoperable e-Career services. This highlights an opportunity to increase the value chain and represents an on-line environment not, as yet, exploited across Europe. These are subsequently called prospective interoperable e-Career services and are written and linked in red on the chart below. In this evolutionary model the European e-Competence Framework (e-CF), the ICT Qualifications Framework (ICTQF) and Europass are included, providing the key references for interoperability.

The concept is being developed to use these European Frameworks as reference ontology for building interoperability among e-Career services between nations. In other words, these frameworks define competences at different proficiency and learning levels (competences are the basis of any considered e-Career service) and a standard way to fill in CVs, in a common defined language. The European e-Competence Framework (e-CF) has been developed to link to local/national competences and job profile frameworks and the ICT Qualifications Framework (ICTQF) and the Europass have been subject to public consultations and therefore all three have
already been exposed to communities of stakeholders. These frameworks therefore satisfy ontology’s conditions.

Accordingly, most of the new interoperable connections inserted in this prospective model are between several e-Career services and the three Frameworks. However, if local e-Career services are already well connected to local/national frameworks (i.e. they have already implemented some mutual levels of interoperability), then connections between the European and local/national Frameworks are sufficient.

The same applies to companies. Organisations can elaborate internal competence and job profile frameworks based on internal processes and then refer to European frameworks identifying common elements. In these ways internal services such as assessment, recruiting, training, etc, can also become interoperable with external e-Career services (e.g. recruitment agencies, certification bodies, training institutions, etc.). In addition European frameworks can be maintained and updated with inputs supplied by companies from internal competence and job profile frameworks.

Furthermore, some other interoperable connections between e-Career services have been included. The purpose is to identify new interoperable links and provide new opportunities to enhance demand and offer e-Career services. For example, diagnostic assessments and summative assessments could be linked as the former results can identify summative assessments. Learning/development programmes can be fed by certification programmes because the latter can become an input for designing and developing qualifications and learning measures, and vice versa.

Last but not least a prospective e-Career service has also been inserted concerned with "emerging competences on the job". ICT professionals can feed this space with emerging competences and job profiles not formalised and implemented within the interoperable system. In other words, this service can monitor these emerging competences and profiles and be open to innovation from a bottom up approach. This service could also contribute to European framework maintenance and updating. Connections could also be made to certification programmes to validate competences acquired on the job (learned within non formal or informal environments).

4.5. The interoperable model – first outcomes

Excluding national exceptions such as the United Kingdom, interoperable e-Career services are not very well developed in Europe. The potential capability of career services is limited by the absence of an integrated environment. This project aims to enhance the value of services to users, by formalising links that could be implemented in future service models. For this reason formalisation does not stop at the functional level, it also relates to technology standards, generally open source, that could be used to provide interoperability at syntactic and semantic levels.
Presently, high interoperable services are mostly concerned with on-line recruitment agencies. However, even though these services allow connections between job seekers and companies by CV-JOB matching, interoperability is mostly at the syntactic technological level, lacking the organisational and semantic dimensions.

In a medium-long term perspective, improvements in the effectiveness and interoperability of related services need to be based on communities of stakeholders (multistakeholder partnerships) sharing common views, tools and frameworks (e.g. competence and job profile frameworks), thus also including the organisational and semantic scopes.

The aim of the project, interoperability of European e-career services, is not to create a portal of e-career services, but to define guidelines and provide a reference model for current and future e-career services.

The main levels of integration for web applications are:

- Presentation Integration (Hyperlinks, Portlet, ...);
- Application Integration (Web Services, WSDL, ...);
- Data Integration (XML, Data Schema, ontology-OWL, ...).

To define technical guidelines for interoperability, the e-Career services project is working at three levels.

**Presentation level**

Hyperlinks already used by most of e-Career Services should be integrated and somehow replaced by portlet standards, such as Java Specification Requests – Portlet Specification (JSR168 and JSR 286) or Web Services for Remote Portlet (WSRP), with the aim to integrate sections of portals inside others, to provide users with the possibility to follow career development paths on a one stop shop. This means that a portal could import different information on career scenarios provided by other websites. Also documentation related to national or European frameworks could be downloaded directly from another section of the portal rather than through hyperlinks. The possibility to use tools to customise portals could significantly improve access to relevant information by user avoiding the need to use disparate navigation interfaces provided by hyperlinks.

**Application level**

At the application level, integration could be achieved by widening the diffusion of web services among the different fields of the HR domain model. The use of web services enables different portals to call remote procedures which allow linkage to various scenarios, for example interacting with learning management systems while measuring on the job performance or assessing
competences. The reference integration model for this layer is SOA (Service Oriented Architecture) and WSDL (Web Services Description Language), and in the HR domain there are vertical WSDL standards as in HR-XML (e.g. Manage development plans in HR-XML model).

### Data level

Content exchange is realised at data level, by using standard languages which allow the management of documents in different environments.

General data exchange standard, such as RSS, could be used to exchange news and non-structured information. More structured information can be modelled by using vertical standards, such as HR XML for the “classic” HR domain or XCRI for course-related information.

In particular, HR XML is a library of XML schemas developed to support a variety of business processes related to human resource management, which can be used to fill the areas of assessment, recruiting, staffing and employee benefits' modelling. As an example, an Internet-based recruiting solution may want to provide clients with a way to order assessments from a third-party assessment firm. HR-XML provides a set of XML schemas defining messages which support this interchange.

XCRI is a standard language used to exchange course related information. This language could be used to define a course by providing information which goes beyond its identifiers and learning outcomes to identify providers and delivery methods. This structure allows portals to work as aggregators of content, where people can find courses suitable to their competences by exploring, for example, learning outcomes.

### Semantic formalisation

As previously expressed, the HR domain complexity involves the need for an ontology-based approach on which to base a common semantic language with different objects and relationships. That is why there should be a quest for spreading ontology languages, described in standard ways such as OWL. This would enhance interoperability given by taxonomies and enable the automatic recognition of elements by creating a semantic network with common meanings. It would connect individual competences, standard frameworks for competences and qualifications and learning outcomes provided by courses. Using a semantic network, provides the possibility to develop a complete professional development path for individuals. In addition companies could identify candidates with competences they need or support professional development by finding appropriate courses and certifications aligned to learning outcomes required by occupational profiles.

An issue to be addressed in this field is the role of language with regard to cross border interoperability. Building the ontology goes beyond the specific language choice, however English
is the most likely choice for a European model owing to its role as a European common language. This is merely a recommendation as multi-language tools could be more effective, but they are much more expensive.

The ultimate interoperability aim is to link each side of the model with the European e-Competence Framework and the ICT Qualifications Framework. By aligning the language used in the semantic network to European standards, all content providers will be assured that their service is understood at the European level.

Table 6, table 7 and table 8 below provide a summary of the analysis referred to in this chapter.

<table>
<thead>
<tr>
<th>e-Career Service</th>
<th>Interoperability</th>
<th>Interoperability realization</th>
<th>Semantic formalisation</th>
<th>e-Government level</th>
<th>Type of service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnostic assessment</td>
<td>Low</td>
<td>Presentation: Link to materials to be downloaded</td>
<td>None</td>
<td>2 – Interaction</td>
<td>Questionnaires to be downloaded</td>
</tr>
<tr>
<td>Recruitment on-line agencies</td>
<td>Medium-High</td>
<td>Data level: HR XML compliant Application level: SOAP interaction</td>
<td>Competency taxonomy</td>
<td>3 – Transaction</td>
<td>Job search, job posting, job-cv matching</td>
</tr>
<tr>
<td>Training programmes Learning development programmes Learning modules/ resources</td>
<td>Low</td>
<td>Presentation: Link to materials to be downloaded Application level: SCORM compliant platforms</td>
<td>None</td>
<td>1 – Informative 2 – Interaction</td>
<td>Mutual related documents to be downloaded</td>
</tr>
<tr>
<td>Certification programmes</td>
<td>Low</td>
<td>Presentation: Link to materials to be downloaded</td>
<td>None</td>
<td>1 – Informative</td>
<td>Documents to be downloaded</td>
</tr>
<tr>
<td>Local/national competence, job profile frameworks</td>
<td>Low</td>
<td>Presentation: Link to materials to be downloaded</td>
<td>None</td>
<td>1 – Informative 2 – Interaction</td>
<td>Documents with national standards of professions, competences, certifications, qualifications, etc. to be downloaded</td>
</tr>
</tbody>
</table>

Table 6: Common interoperable e-Career services (see also figure 4)
<table>
<thead>
<tr>
<th>e-Career Service</th>
<th>Interoperability</th>
<th>Standards for interoperability</th>
<th>Semantic formalisation</th>
<th>e-Government level</th>
<th>Type of service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnostic assessment</td>
<td>Medium</td>
<td>Application level: WSDL, SOAP Data level: HR XML compliant</td>
<td>Taxonomies</td>
<td>3 – Transaction</td>
<td>Forms related to local/national frameworks to be filled in online</td>
</tr>
<tr>
<td>Summative assessment</td>
<td>Low-Medium</td>
<td>Presentation: Link to external systems to retrieve documents</td>
<td>None</td>
<td>2 – Interaction 3 – Transaction</td>
<td>Documents on tests specifications related to learning modules from external systems</td>
</tr>
<tr>
<td>Local/national competence, job profile frameworks</td>
<td>Low-Medium</td>
<td>Presentation: Documents downloading, Link to external systems</td>
<td>None</td>
<td>2 – Interaction 3 – Transaction</td>
<td>Documents related to learning modules and certifications; when connections are with external systems (e.g. Ministry of education), their positioning is at level 3 - transaction</td>
</tr>
</tbody>
</table>

Table 7: Uncommon interoperable e-Career services (see also figure 5)

<table>
<thead>
<tr>
<th>e-Career Service</th>
<th>Interoperability</th>
<th>Standards for interoperability</th>
<th>Semantic formalisation</th>
<th>e-Government level</th>
<th>Type of service</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Frameworks (e-CF, ICTQF, Europass)</td>
<td>High</td>
<td>Presentation level: portlet standard interaction (using JSR Portlet or WSRP) Application level: WSDL or other web services languages Data level: HR XML, XCRI</td>
<td>Ontologies, also formalized in OWL</td>
<td>3 – Transaction 4 – Interaction</td>
<td>Standard language Related to European and local e-Career services (e.g. training, certifications, assessments, recruitment) Related to local/national frameworks</td>
</tr>
<tr>
<td>Assessments</td>
<td></td>
<td>Presentation level: portlet standard interaction Application level: WSDL or other web services languages</td>
<td>Ontologies written in OWL</td>
<td></td>
<td>Mutual related and related to training, certifications and recruitment To be filled on line in case of</td>
</tr>
<tr>
<td>e-Career Service</td>
<td>Interoperability</td>
<td>Standards for interoperability</td>
<td>Semantic formalisation</td>
<td>e-Government level</td>
<td>Type of service</td>
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</tr>
<tr>
<td>Training programmes Learning development programmes Learning modules/resources</td>
<td></td>
<td>Data level: HR XML; XCRI</td>
<td>Ontologies written in OWL</td>
<td>knowledge and skills</td>
<td></td>
</tr>
<tr>
<td>Certification programmes</td>
<td></td>
<td>Presentation level: portlet standard interaction Application level: WSDL or other web services languages; SCORM compliant platforms Data level: XCRI</td>
<td>Ontologies written in OWL</td>
<td></td>
<td>Related to local/national frameworks, learning modules, summative assessments</td>
</tr>
<tr>
<td>Local/national competence, job profile frameworks</td>
<td></td>
<td>Presentation level: portlet standard interaction Application level: WSDL or other web services languages Data level: HR XML; XCRI</td>
<td>Ontologies written in OWL</td>
<td></td>
<td>Related to training – learning modules, certifications, recruitment, assessments Related to the European frameworks</td>
</tr>
</tbody>
</table>

Table 8: Prospective interoperable e-Career services (see also figure 6)

4.6. Developing and implementing interoperability on a European e-Skills level
Some e-Career services can be developed at a European level as references for interested stakeholders (including training or certification institutions, companies or professionals). As they offer neutral indications on European e-competences’ trends and needs; they can be included into the EU e-Skills Portal.

In order to guarantee mutually interoperable connections and interoperability with all the other local/ national e-Career services wishing to share information, such services of the European e-Skills Portal should be developed on the basis of the new European Frameworks, i.e. the the European e-Competence Framework (e-CF), the ICT Qualifications Framework and even Europass, as explained in the previous paragraphs.
In Figure 6 an example of possible European e-Career services within the EU e-Skills Portal is shown.

Figure 6: Developing interoperability – Possible key services for the European e-Skills portal, feasible in the near future

Then, further local/ national e-Career services can connect to services provided by the EU e-Skills Portal. In order to connect, they need to relate to the European Frameworks, too. Motivation to connect to a European network can be e.g. to enter a broader market.

In Figure 7, as an example, Training and Certification institutions can connect to the “central” e-career services provided by the European e-Skills Portal regarding diagnostic assessment and curricula.

Figure 7: Training and certification institutions connected to some EU e-Skills portal e-Career services
4.7. Developing interoperability in European and national portal environments

If e-Career services are well connected to local/national frameworks (i.e. they have already implemented some mutual levels of interoperability), then connections between the local/national and European Frameworks are sufficient. The same is true for portals. If local e-Career services are well connected to local/national e-Career portals, then it is sufficient that local/national portals connect to the EU e-Skills Portal. In this way, through interoperability, they can share services and mutually exchange information.

Figure 8 shows the direct connection between local/national portals and the EU e-Skills portal.

5. OVERVIEW AND CONCLUSIONS OF THE FIRST PROJECT PHASE

The analysis carried out in the first project phase has confirmed the existence of a large number of e-career services offered by e-Skills and ICT career websites and portals from national, local/sectoral levels provided from a wide variety of public and private institutions, by recognised training organisations or agencies for employment.

It has also highlighted the low level of mutual connectivity between e-career services. Only the UK demonstrates a good level of interoperability facilitated by National Occupational Standards linked to the National Qualifications Framework, sectoral skill standards, reference learning modules, assessment procedures and recognised provider institutions.
In general, the lack of interoperability between services means fragmentation of information to users, repetition of actions by users, and loss of information by providers and users. In other words, inefficiency, higher costs, and lost opportunities.

Furthermore, the work of the initial project phase highlights the relevance and importance of reference standards and frameworks to foster interoperability.

UK e-career services show high levels of integration and coherence because they are based on common shared frameworks. Currently, some international job search/job CV-matching services (such as Monster) have reached a good levels of syntactic interoperability, but they lack common standards to make it easier to:

a) Understand companies’ needs, qualification titles, and competences
b) Identify semantic-based mutual connections
c) Simplify demand and offer formats
d) Improve e-Career services’ accuracy and effectiveness

In this way even advanced international services have introduced inefficiencies and low efficacy.

**How to move forward?**

In support of ICT-related e-career services, the recently launched European e-Competence Framework, together with the European Qualifications Framework and EUROPASS have the potential to become reference standards locally and Europe-wide.

All career services are fundamentally based on competences (e.g. services about competence assessment, curricula or job profile building and matching, etc.) or on learning outcomes (e.g. services about qualification offer, formative assessment, curricula of studies building and matching, etc.).

Therefore construction of guidelines and procedures linking e-competences and learning outcomes are required to make the European e-Competence Framework, the EQF and Europass mutually interoperable and make them a reference for ICT-related e-career services interoperability in Europe.

Initial findings and the reasoning and methodology behind the elaboration of guidelines for increasing interoperability of ICT career websites in Europe have been explained in this interim report. The report provides a visible milestone towards a CEN Workshop Agreement “Interoperability of European e-Carer services” to be available in spring 2009.
6. NEXT STEPS AND OUTLOOK

6.1. Final development of the interoperable model and stakeholder interaction

The initial outcomes on the interoperable model, as presented in this interim report, provide the basis for collecting further input and feedback in the European multistakeholder environment. Final recommendations for Interoperability of European ICT career and e-Skills services will be elaborated from this work.

The development of the final interoperable model includes revising and optimising both practical dimensions of interoperability, the technical and functional features. Suggestions on how to develop interoperability in a European e-Skills Portal environment connected to national, local and international portals will be further developed. As a key concept for interoperability, the final report will also focus on how to connect ICT competences of the European e-Competence Framework (expressing the e-Skills market demand) to ICT qualifications (expressing the e-Skills market offer).

Additional work requirement for this competence/qualification connection standard is explained in the next chapter.

To ensure the engagement of a broad range of multistakeholder views, a feedback form will be made available online. Two further meetings – one of the CEN Workshop Community and one of the Pilot-experimental Network of stakeholders – are planned for February 2009.

6.2. Development of the competences/ qualifications connection standard

As mentioned in chapter 2.2.5 and 5, e-Career services are often based on “competences” or “learning outcomes”. If we take diagnostic assessments or summative assessments, curricula and job profiles, job posting, certifications; all of these services relate to competence models/definitions/descriptions. If we take qualifications, learning and training programmes, formative assessment, learning modules and summative assessments, they relate to “learning outcomes” specifications.

Consequently if we want to connect, for example, assessments to qualifications, summative assessments to curricula, curricula to qualifications, and so on, we need a common language to base these connections.

The question is, how to connect competences to learning outcomes and hence to qualifications (and other related services)?

To connect competences to learning outcomes, they need to be expressed in the same way using the same vocabulary.

In previous projects, i.e. the European e-Competence Framework development and the ICT Lane project, both aligned to the EQF, compliant definitions of competence and learning outcomes were provided.
In particular:

1. Competence and learning outcomes are described through “operational descriptions”, i.e. verifiable and provable statements.

2. Learning outcomes are: “statements of what a learner knows, understands and is able to do on completion of a learning process, which are defined in terms of knowledge, skills and competence” (EQF).

3. Competences are:
   a. “the proven ability to use knowledge, skills and personal, social and/ or methodological abilities, in work or study situations and in professional and personal development” (EQF).
   b. “demonstrated abilities to apply knowledge, skills and attitudes for achieving observable results” (e-CF).

These definitions provide the necessary basis for the development of a connection model.

Furthermore, both learning outcomes and competences mention “knowledge” and “skills”; hence, these two mutual components can become the “linkage” between them. This possible connection is shown in the schema below.

![Diagram showing the linkage between competences and learning outcomes](image)

Figure 9: Linkage between competences and learning outcomes

Accordingly, the connection model is to be based on:

1. shared knowledge and skill definitions
2. an effective way to “build” knowledge and skills
3. an open “dictionary” of knowledge, skills to make increase and to crop through stakeholders’ communities.
However in relationship to the definitions provided, context plays a crucial role regarding competence. Proven abilities and observable results cannot be context free. Contexts specify the real meaning of competences. Contexts also specify proficiency levels (as defined in the e-CF), on the job, or learning levels (as defined in the EQF), in learning programmes.

Consequently, the forthcoming competence/qualification connection standard also includes

4. clusters of contexts and conditions, that can help identify reference environments, the specific objectives and the related proficiency/learning levels

According to the reference schema described above, and in line with EQF, the European e-Competence Framework and ICT Lane project outcomes, knowledge and skills can be defined as following:

1. Knowledge: Set of know-what (e.g. programming languages, design tools...)
2. Skills: Abilities to carry out managerial or technical tasks

Both are described by operational descriptions.

As ‘Knowledge’ is here considered as “Know-What” only, then it can be managed as an “object”. Skills, describing “knowledge in action”, i.e. know-how and the ability to do; can be represented by an “action verb”. Hence together they can then be managed as “action verbs” plus an object.

In the ICT Lane project, a first effective way to “build” knowledge and skills was provided, as shown in the following schema.

---

**How to write the learning outcomes (skills or knowledge)**

Verify if the learning outcome related to the qualification is already in the list of learning outcomes provided inside the library (database). If it is not, then create a new learning outcome.

If the learning outcome to be created is a skill, then:

I. Verify if the action verb required to build the skill is in the list of action verbs (AVs) provided inside the library (data base).
II. If it is not, then propose a new AV and add it to the library

Describe the skill with:

I. the action-verb - AV - selected or created +
II. a direct object - DO - +
III. if necessary, an indirect object - IO - (specification object)

*E.g.:* **Connect a computer to a large bandwidth network**

(\text{AV}) \quad (DO) \quad (IO)

If the learning outcome to be created is a knowledge, then:

I. use the verb Know + an object

*E.g.:* **Know application tools**

---

Schema 1: effective approach to build knowledge and skill learning outcomes (Source: www.ict-lane.eu)
As mentioned above, to build competence and skill (hence action verbs and objects), context and conditions, are necessary. These include:

- knowledge as content objects known + conditions or criteria of usability - domain application of these content objects
- skills as expected actions or behaviours + conditions or criteria of success of these actions or behaviours
- context, in reference to a professional situation (for skills), or to a technical & scientific domain (for knowledge),

**Figure 10:** The revised figure 9 – linkage between competence and learning outcomes considering the context

A competence / qualification connection standard is being developed based upon this structure.
6.3. **Sustainability: Implementing the outcomes in a European online environment**

In a medium-long term perspective, with the aim of connecting many external systems to improve the effectiveness, interoperability of services will be based on communities of stakeholders (multistakeholder partnerships) sharing common views, tools and frameworks (e.g. competence and job profile frameworks), including the organisational and semantic scopes.

Besides organisational and semantic issues that are crucial for successful interoperability, two other topics are relevant;

- New business models for HR domain interoperability can provide high level service opportunities to users, whether professionals, companies, training or certification institutions.

  The ability to find and to manage relevant information on the web provides an opportunity for new business models to plan new ways of conceiving products, services, and pricing.

- Standard and open source technologies versus proprietary and closed ones.

  Standards are the basis for real interoperability: open source solutions are usually recommended. The reasons lay not so much on cost reduction but on diffusion and continuous improvement. Adopting open source solutions creates communities around software technologies, for example, if developers seek interoperability, they are able to use the technologies developed so far and improve them, based on an “open” approach. This concept supports continuous improvement and facilitates an increase in standard-sharing, making systems’ interoperability easier. A virtuous circle of interoperability expansion is then created.

6.4. **Future ontology development, future of e-Career services... ?**

Interoperability means the ability of Information and Communication technology (ICT) systems and of the business processes they support to exchange data and to enable the sharing of information and knowledge.\(^{45}\)

The aim of creating an interoperable model of e-Career services, from the technological perspective, cannot be regardless of the creation of services supported by technologies which assure high levels in the e-Government stages.

Further studies should be addressed to the development of interoperability at the three levels, presentation, application and data. In addition research is required on a semantic level, where the development of ontologies could make it feasible to create automatic tools to link different topics of the HR domain model. Most importantly, without the organisational level, i.e. stakeholders’ communities – multistakeholder partnerships, the semantic level cannot be developed.

---

\(^{45}\) IDABC-EIF 2004
### GLOSSARY, REFERENCES, LINKOGRAPHY

<table>
<thead>
<tr>
<th>Classification</th>
<th>Item</th>
<th>Definition/ description for e-Career project context</th>
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</thead>
</table>
| **Project underpinning methodology – basic definitions** | e-Career Services                                                  | Services that help people grow from a professional point of view in their career development through online tools. In this project, they are related to the ICT work. They can provide online information (e.g. most simple: website), but also complexe online performances (e.g. most advanced: online assessments). Target audiences of such services are e.g.:  
- Individuals (work related to ICT: practitioners and ICT/HR managers, job seekers, looking for ICT career orientation)  
- companies, certification and training bodies (…). |
| Interoperability                                    |                                                                      | Interoperability means the ability of information and communication technology (ICT) systems and of the business processes they support to exchange data and to enable the sharing of information and knowledge. There are two types:  
1) Syntactic/technical interoperability  
   Technical interoperability covers the technical issues of linking computer systems and services. Key aspects include open interfaces, interconnection services, data integration and middleware, data presentation and exchange, accessibility and security services  
2) Semantic interoperability  
   Semantic Interoperability is concerned with ensuring that the precise meaning of exchanged information is understandable by any other application that was not initially developed for this purpose. It thus enables systems to combine received information with other information resources. |
| Ontology                                            |                                                                      | Describes a domain – a piece of world – by identifying and defining the “core” objects inside and relationships between them. Accordingly, it is necessary to involve European relevant stakeholders in the definition phase because any “reference universe” can be defined in many different ways. Example of the e-Career project work:  
- e.g. objects: e-Career Services to be identified (core objects and objects inside)  
- e.g. relationships: Curricula and Job matching |
| HR domain element – target group PEOPLE             | Candidate’s curriculum / portfolio                                   | Services related to competences profiling                                                                                                                                                                                                                                                                                                                                                          |
|                                                     | Diagnostic assessment                                               | Services related to the evaluation of people’s capabilities                                                                                                                                                                                                                                                                                                                                       |
|                                                     | Internal / external job posting                                      | Services related to the possibility, for companies, to post their job requirements towards companies inside the same group or towards the outside                                                                                                                                                                                                                          |
| HR domain element – target group COMPANIES          | Business processes / work activities                                  | Services which allow a company to define competences according to business process or work activity analysis                                                                                                                                                                                                                                                                                          |
|                                                     | Company profiles and competences (Internal frameworks)              | Internal services of a company, providing job areas and business units with profiles and competences information and tools                                                                                                                                                                                                                                                                                                                      |
|                                                     | Internal assessment                                                 | Services related to the possibility, for companies, to make an internal assessment of their employees                                                                                                                                                                                                                                                                                                                                 |
|                                                     | Project activities                                                  | Services which allow a company to define competences according to project activities                                                                                                                                                                                                                                                                                                                                                                                 |
### Classification Table

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<tr>
<th>Classification</th>
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<td>Certification programs</td>
<td>Services which enable to identify useful certification programmes</td>
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<td>Formative assessment</td>
<td>Services which give the possibility to evaluate the learning outcomes reached at the end of each learning module through periodical tests</td>
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<td>Learning modules/resources</td>
<td>Services involving the offering of learning modules, distributed by Training Bodies or providing learning resources (e.g. documents)</td>
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<td>Learning and development programs</td>
<td>Services that enable to identify possible learning paths and learning processes within non formal – informal learning environments</td>
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<td>Summative assessment (for certification)</td>
<td>Services that allow to evaluate people’s competences to issue certifications, i.e. final assessments</td>
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### Analysed portals - website references

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<td>Le Portail des Métiers de l'Internet</td>
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<td>Learndirect</td>
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<td>EADS</td>
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<td>Gesellschaft für Informatik E. V.</td>
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<td>CompTIA TECH Career Compass</td>
<td><a href="http://tcc.comptia.org">http://tcc.comptia.org</a></td>
<td>USA</td>
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<tr>
<td>Germany Occuprofiler (Occupational Profiling)</td>
<td><a href="http://de.occuprofiler.com">http://de.occuprofiler.com</a></td>
<td>Germany</td>
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</table>
Pilot-experimental Network of Stakeholders (PEN)

Afpa France
Aica Italy
Airbus Deutschland Germany
Assolombarda Italy
Breyer Publico Germany
Cedefop EU
CEN/ISSS (project on e-Certification) EU
CNE-CSE / Uni Europa EU / Belgium
Cigref France
e-Skills UK UK
European Center for Women and Technology EU/ Norway
Fondazione Politecnico di Milano Italy
HBO-I The Netherlands
EMF EU
EUN EU
Eurocadres EU / Austria
IG Metall (Kibnet) Germany
Italia Lavoro Italy
NIOC The Netherlands
Ministère de l’enseignement supérieure et de la recherche France
Regione Lombardia Italy

Publications


Marinoni Clementina, *Competence and Job Profile Frameworks: a precondition for interoperability of eCareer and eLearning Services*, The Second International Workshop on Ontology-Based Competency Modeling Frameworks, Maastricht, 07-10-17


Pernici Barbara, Locatelli Paolo, Marinoni Clementina, *The eCCO System: An eCompetence Management Tool Based on Semantic Networks*, Springer Berlin, 2006; On The Move, OTM Federated Conferences and Workshops, Montpellier, 06-10

**Linkography**

European e-Competence Framework
[http://www.ecompetences.eu](http://www.ecompetences.eu)


ICT Lane – Towards a shared European language for ICT qualifications and competences
[http://www.ict-lane.eu](http://www.ict-lane.eu)


Specific website: [http://www.w3.org/TR/owl-features/](http://www.w3.org/TR/owl-features/)


Specific website: [http://www.w3.org/TR/soap/](http://www.w3.org/TR/soap/)

TRACE project
[http://trace.education-observatories.net](http://trace.education-observatories.net)

WSDL (Web Services Description Language), Wikipedia:
[http://en.wikipedia.org/wiki/Web_Services_Description_Language](http://en.wikipedia.org/wiki/Web_Services_Description_Language), Specific website:
[http://www.w3.org/TR/wSDL](http://www.w3.org/TR/wSDL)

WSRP (Web Services for Remote Portlet), Wikipedia:

Specific website: [http://www.xcri.org](http://www.xcri.org)