

# EUROPEAN LEARNER MOBILITY STANDARDIZATION: SKETCHING THE LANDSCAPE

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## 1. EXECUTIVE SUMMARY

The enhancement of learner mobility and employability is undoubtedly a high priority action item within the European Education Area. The establishment of the ECTS and Europass as a framework for the transparent description of qualifications and competences aspires to provide the common basis for the well-structured recording of all opportunities for life-long learning including European higher education structures and learners' private / institution-owned information. The adoption of this framework demonstrates that European Education has reached a maturity stage where the recording and exchange of learner mobility information needs to be efficiently supported by technical interoperability standards.

The European Learner Mobility project has been recently launched within the European Committee for Standardization (CEN/ISSS). ELM follows two parallel, yet equally important standardization paths: one, that directly addresses the European requirement for rapid implementation and dissemination of the transparency information tools throughout Europe (starting with the Diploma Supplement); while the other focuses on sketching the broader mobility landscape, thus providing the vision and preparing the grounds for the further development, augmentation and exploitation of transparency information that will lead to the implementation of valuable services to the community (e-portfolio, learning and employment opportunity exploration, etc). ELM brings together experts in learner information and learning opportunities standardization, experts in European transparency policies, as well as Information Systems developers active in learner information management.

This article presents the actions, the methodological approach, the so far produced and the expected outcomes of the ELM standardization activities, mainly regarding the efforts towards an interoperable Diploma Supplement specification.

## 2. INTRODUCTION

The enhancement of learner mobility and employability is undoubtedly a high priority action item within the European Education Area. The establishment of the European Credit Transfer System (ECTS) and Europass as a framework for the transparent description of qualifications and competences provides the common basis for the well-structured recording of all opportunities for life-long learning including European higher education structures and learners' private / institution-owned information.

The establishment of a common framework which is accepted all over Europe demonstrates that European Education has reached a maturity stage where the recording and exchange of Learner Mobility information needs to be efficiently supported by technical interoperability standards.

Several relevant standardization efforts exist and significant national expertise has already been accumulated. However, harmonization is deemed necessary towards a European solution, in order to provide viable support for emerging European learner information systems and dissuade service providers from developing proprietary services and platforms. This solution will support the development of a new generation of technology-enhanced services for learners (learning and employment opportunities exploration), higher educational institutions administrations (certification or augmentation of learner information), employers (work-place descriptions, recruiting and development of learners' competencies) and other stakeholders of learning, education and training throughout Europe, as the European Union and Commission, the Member States and their governments and ministries, etc.

The DS is considered one of the most important Europass documents, having an essential role in the transparent interpretation and recognition of academic and professional qualifications (diplomas, degrees, certificates) across the diverse European educational systems map. In particular, the Europass DS aims at:

- Promoting transparency within and between higher education systems;
- Providing accurate and up-to-date information on an individual's qualifications;
- Aiding mobility and access to further study and employment abroad;
- Providing fair and informed information relating to qualifications; and
- Facilitating academic and professional recognition and thus increasing the transparency of qualifications.

The DS constitutes an instrument upon which a high level of agreement on the content and structure has been achieved among the EU member states. Indeed, most of the European countries have taken up the DS initiative and have specified their national variants of DS, in most cases being minor variations of the Europass DS. However, currently the DS is mostly issued in paper-based format. In cases where it is issued electronically, the DS is represented in a proprietary manner. A major problem is now the lack of interoperable tools, impeding the recording and/or reuse of data in existing student management systems for the production of an electronic DS and the exchange of information among interested parties.

The CEN/ISSS Learning Technology standardization entities, namely the CEN Workshop on Learning Technologies (WSLT) and the CEN Technical Committee 353 "Information and Communication Technologies for Learning, Education and Training" are undertaking an active role in providing technical interoperability standards for documents agreed by the EU in order to support the exchange of Europe-wide learner and employment information. This is a unique opportunity for the LT standardization domain to be acknowledged as a key player in the evolution of the European learner mobility landscape and to lead the way towards sustainable Information Systems and tools, and, eventually, towards a European backbone for learner mobility and employability services.

This article presents the methodological approach and current outcomes of the ongoing European Learner Mobility (ELM) standardization project launched within CEN.

### **3. EUROPEAN LEARNER MOBILITY BACKGROUND AND RATIONALE**

The ELM project was launched in January 2009, having as main objective the provision of data models, specifications and guidelines for the expression and exchange of learner mobility information, as defined by the European Transparency instruments. Making the first step towards standardization in this field demands the definition of a comprehensive European Learner Mobility model, in terms of existing information structures and technological standards, and the elicitation of priorities for the creation of required interoperability specifications.

As perceived within the context of the project, ELM should follow two parallel, yet equally important standardization paths: one, that directly addresses the European requirement for rapid implementation and dissemination of the transparency information tools throughout Europe; while the other focuses on sketching the broader mobility landscape, thus providing the vision and preparing the grounds for the further development, augmentation and exploitation of transparency information that will lead to the implementation of valuable services to the community (e-portfolio, learning and employment opportunity exploration, etc).

The overall modeling effort for covering all the different aspects of ELM is indeed an ambitious and demanding task, likely to unfold through a series of phases and result in a multipart standard.

Dealing with the Europass DS, as a significant tool for conveying Higher Education (HE) achievement information, is the first important strand of this standardization work. The overall results of the project are expected to:

- Contribute to the consolidation and European-wide adoption of electronic transparency documents.
- Support the development of information systems for the implementation of the Bologna process, at institutional, national and European levels.
- Support learner mobility and quality assurance in the European educational setting.
- Support the wider availability of brokerage services across the EU.
- Enable data consistency and facilitate data quality management.

On this basis, the initiated tasks within the ELM project are set out to:

- provide immediate solutions, and demonstrate the leading role of the learning technology standardization community in the harmonization and stimulation of European decisions; and, at the same time,
- prepare new recommendations with the explicit aim of outlining the future directions of learning technology standardization work for addressing emerging needs.

In the following paragraphs we present the approach followed for the development of an ELM Diploma Supplement model, as an application profile of existing specifications and standards. First, we provide some background information on application profiling and related methodological tools. In continuation, the current modeling activities and produced outcomes are presented. The article concludes with the discussion of future actions for ELM standardization.

### **4. WHY APPLICATION PROFILES?**

Well established metadata standards for cross-domain and domain-specific information resource description have already been around for quite sometime. Dublin Core Metadata and IEEE Learning Object Metadata, among others, are examples of such standards, providing semantic support for a broad range of purposes and business models.

Implementers often make explicit choices on the adoption of a metadata vocabulary for their particular service or system. Although they approve of re-use and acknowledge the importance of interoperability, the pressure to satisfy local requirements often forces adoption of subsets of possible options and interpretations. Indeed, different starting points, different functional requirements and levels of granularity for different things, different views of "reality", justify such practice, which, nevertheless, results to a tension between standard terms and localizations, and ends up hindering interoperability instead of supporting it.

So, what is the right course to be followed? As Godfrey Rust pinpoints (Rust, 2005): *"The days of "one size fits all" standards are over...Domains are now overlapping and becoming "liquid"...The challenge now is interoperability and re-purposing"*, through the building of metadata standards application profiles.

The term Application Profile (AP) denotes the *"assemblage of metadata elements selected from one or more metadata schemas and combined in a compound schema. The purpose of an application profile is to adapt or combine existing schemas into a package that is tailored to the functional requirements of a particular application, while retaining interoperability with the original base schemas"* (CEN/ISSS WSLT, 2006).

Application profiling provides with the ability to use community or domain-specific metadata standards or component parts of those standards in combination. By following application profiling principles, the implementers of metadata standards are able to assemble the components that they require for some particular set of functions. They are also safe in the knowledge that the assembled whole can be interpreted correctly by independently designed applications (Nillson, Miles, et. al., 2008).

Building APs involves the following processes (Hillman, 2006):

- Determining the AP scope and purpose: outline of a specific community for the AP (who the target users are; who the stakeholders are; what the political realities are), identification of the community's information exchange needs, participation of metadata aware practitioners, etc.
- Choosing a basic schema (format): research on what others in the domain are using, consideration of stability/volatility of the standard and of how the community for the standard integrates new needs and ideas, documentation of choices and reasoning for attributes for describing terms
- Setting up documentation, decision making and community review processes
- Maintaining realistic expectations: creating an AP takes time, requires organizational effort and persistence may not be a model that can be sustained or re-produced in other communities.

In 2008 the Dublin Core Metadata Initiative issued the Singapore Framework for Dublin Core Application Profiles (DCAPs) (Nillson, Baker, et. al., 2008) providing a formalization for building and documenting APs. The DC notion of the AP imposes no limitations on whether those properties or encoding schemes are defined and managed by the Dublin Core Metadata Initiative or by some agency (Nillson, Miles, et. al., 2008). As described in the framework, a DCAP is a packet of documentation containing:

- Functional requirements, describing the functions that the application profile is designed to support, as well as functions that are out of scope
- A domain model, defining the basic entities and their relationships using a formal or informal modeling framework.
- A Description Set Profile, designed to offer a simple constraint language for metadata
- Usage guidelines, describing how to apply the application profile, how the used properties are intended to be used in the application context etc.
- Encoding syntax guidelines, defining application profile-specific syntaxes, if any.

## **5. Towards a Diploma Supplement Application Profile**

The above has been the exact methodological framework for the development of an interoperability specification for the Europass DS.

As far as the DS AP scope and functions, a quite unique characteristic of the ELM standardization project is that the identification of the core functional requirements for the exchange of learners' Higher Education achievement information, has already been carried out at EU policy level. The Europass DS information structure is the recommendation for addressing these requirements. However, there is still lot to be explored in terms of stakeholder communities and services that will add value to the emerging standardization infrastructure.

On this basis, the project has established a team of standardization experts (project team) in the field of learner information and learning opportunities data modeling. In addition, representation from ICT industry with implementation expertise in student management systems has been anticipated in order to add an important implementers' perspective to the overall effort.

Since the beginning of ELM, the project team has conducted research and extensive study of the EU-defined transparency information structures, their so far application in the European countries and the problems that arise (e.g. security issues). In alignment with the "application profiling culture", there has been a firm decision to investigate the utilization of currently available interoperability specifications and standards, rather than develop a new isolated specification and to draw on the extensive application profiling experience of transparency documents in European countries such as the UK, Norway, Germany, France and Greece.

This research work has led to the choice of a set of schemas as a "mix and match" basis for the production of the ELM DS specification: the Metadata for Learning Opportunities - Advertising (MLO-AD) (CEN/ISSS WSLT, 2008) and its ECTS refinements cover a substantial part of the technical representation aspects of DS information, given that a large subset of HE mobility information is related to the description and referencing on learning opportunities. In addition, ELM DS re-uses the emerging specification on a Credit Information Model, due to its particular capability of representing credit information in learning opportunities and transcripts of results for units of learning. Last but not least, consolidated DC and vCard elements are utilized.

Based on the above assumptions, the following sections provide an overview of what has been achieved so far in terms of the definition of the ELM DS model. The model comprises two main constituents:

- a conceptual model, aiming at the description of the semantics of the DS field. The conceptual model represents identified resources (both re-used and domain-specific defined) and a series of assertions about the domain's inherent processes.
- a domain model, providing a formalized description of the DS resources and their associations

The ELM DS model shares a set of terms and definitions (CEN/ISSS WSLT ELM PT, 2009) that carry terms semantics. This set of terms can be regarded as the vocabulary of the DS application or community that the application profile is designed to support.

## 5.1. The ELM DS Conceptual Model

Figure 1 illustrates a high-level working model for the DS domain and has been produced as part of the functional requirements documentation. This conceptual model diagram follows the conventions of Object-Role Modeling (alias NIAM) (ORM 2, 2005).

A non exhaustive list of statements conveyed through this model, as far as the DS processes are concerned, includes the following:

- An *MLO Specification* specifies an *MLO Instance*. An *MLO Instance* instantiates an *MLO Specification*.
- An *MLO Provider* offers an *MLO Specification*. An *MLO Instance* is offered at an *MLO Provider*.
- An *MLO Specification* leads to a *Qualification Type*.
- An *MLO Specification* is credited with some *ELM Credit*.
- An *MLO Instance* has a *Time Interval*.
- An *ELM Person* takes an *MLO Instance*. An *MLO Instance* has as participant an *ELM Person*.

An *ELM Person* is assessed by an *ELM Evaluation Instance*. An *ELM Evaluation Instance* assesses the attainment of an *ELM Person*.

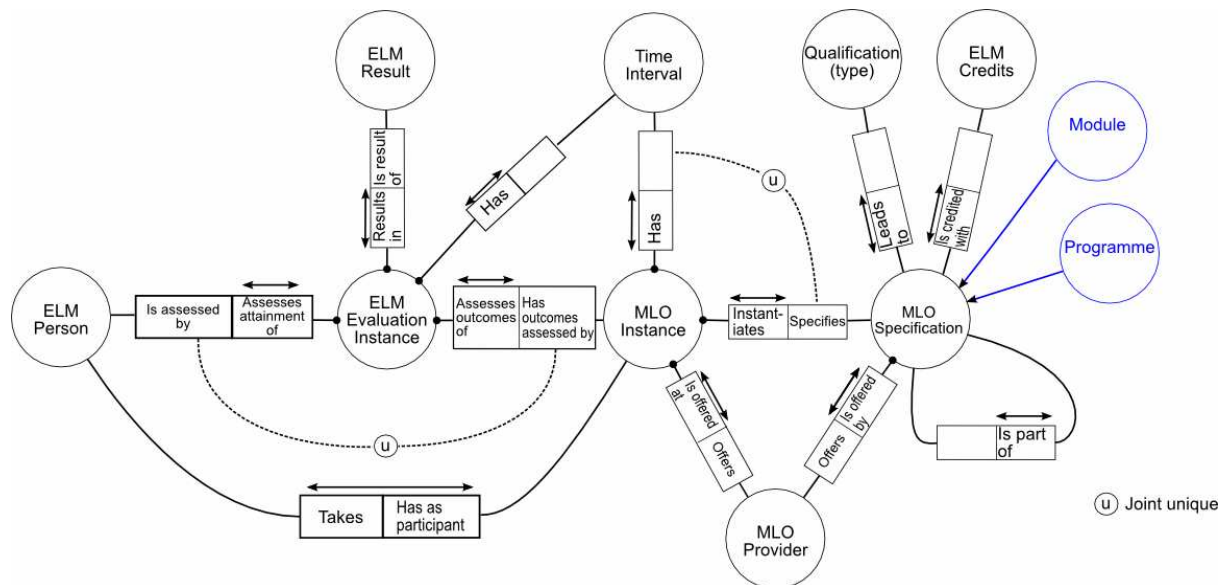


Figure 1- ELM Diploma Supplement Conceptual Model

As aforementioned, the domain entities illustrated in Figure 1 are formally defined in the ELM DS set of terms and definitions (CEN/ISSS WSLT ELM PT, 2009). However, for the shake of clarity in the above statements, some of the terms and associated definitions are herein provided:

A *Learning Opportunity Specification (MLO Specification)* is an abstract description of a learning opportunity, consisting of information that will be consistent across multiple instances of the learning opportunity. For the DS domain, a learning opportunity specification regards either an entire programme of study, or a component module within such a programme.

A *Learning Opportunity Instance (MLO Instance)* is a single occurrence of a learning opportunity. Unlike a learning opportunity specification, a Learning Opportunity Instance is not abstract, may be bound to particular dates or locations, and may be applied for or participated in by learners.

## 5.2. The ELM DS Domain Model

The domain model defines the basic entities described by the application profile and their fundamental relationships. The purpose of the domain model is to define a basic scope for the application profile (Nillson, Baker, et. al., 2008). On this basis, the domain model of ELM DS describes the *Diploma Supplement Document* entity as consisting of:

- a *Person* instance, representing the learner/holder of a formally awarded qualification;
- a *Provider* instance, representing the awarding institution; and,
- a *Diploma* instance, comprising information about the learning opportunity, at programme level, leading to the described qualification, as well as the actual result for the specific person;
- a *Transcript* instance, containing learning opportunity instances representing the modules, each of which contains provider, credit, and result information;
- an *Additional Information* property containing a description of additional qualification information.

Figure 2 illustrates representation of the domain model entities and relationships in Unified Modeling Language (UML) format (UML, 2007).

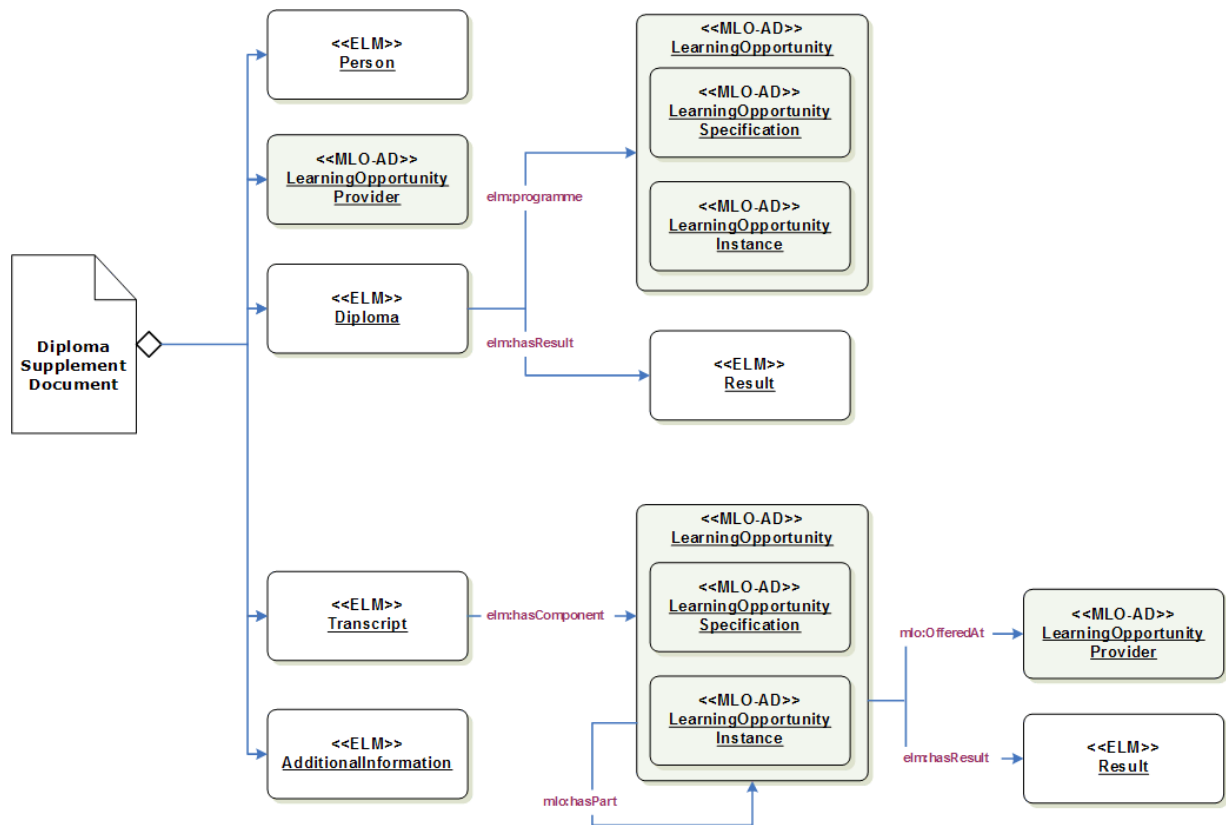


Figure 2- ELM Diploma Supplement Domain Model

In addition, the domain model includes definitions of the resources, properties and associations, based on the Resource Description Framework Schema (RDFS) constructs. Examples of such definitions for the ELM DS *Result* class, the *Has Component* association and the *Additional Information* property are provided below:

**URI:** [elm:Result](#)

**Label:** Result

**Domain:** Resource

**Range:** Class

**Definition:** A mark, grade or classification of the actual outcome of an evaluation instance for a learning opportunity for a person as stated by a provider.

**Comments:** Modelling of result information. Relates to Europass DS sections 4.3 and 4.5

**URI:** [elm:hasComponent](#)

**Label:** Has Component

**Domain:** Resource

**Range:** elm:LearningOpportunity

**Sub Property Of:** dc:relation

**Definition:** A relation of a resource to a learning opportunity, where the learning opportunity represents one of potentially many component parts of the resource

**Comments:** For example, to represent the relationship between a Transcript and a collection of modules

**URI:** [elm:additionalInformation](#)

**Label:** Additional Information

**Domain:** <http://www.w3.org/2000/01/rdf-schema#Resource>

**Range:** <http://www.w3.org/2000/01/rdf-schema#Resource>

**Definition:** Additional information concerning the resource

**Comments:** For example, additional information about the diploma supplement

### 5.3. The ELM DS Description Set Profile

The Dublin Core Description Set Profile (DSP) model is designed to offer a simple constraint language for metadata. A DSP constrains the resources that may be described by descriptions in a description set conforming to the application profile, the properties that may be used, and the ways a value may be referenced [SF]. Within the context of the ELM DS natural language constraints have so far been defined for the resources.

For example, the Diploma Supplement Document entity can be constrained according to the following clauses:

- The Diploma Supplement Document is a record that contains diploma supplement information.
- A Diploma Supplement Document **MUST** contain one and only one elm:Person instance
- A Diploma Supplement Document **MUST** contain one and only one mlo:LearningOpportunityProvider instance
  - The mlo:LearningOpportunityProvider instance **MUST** contain at least one http://purl.org/dc/elements/1.1/identifier property
  - The mlo:LearningOpportunityProvider instance **MUST** contain at least one http://purl.org/dc/elements/1.1/title property
  - The mlo:LearningOpportunityProvider instance **MUST** contain at least one http://purl.org/dc/elements/1.1/description property
- A Diploma Supplement Document **MAY** contain one and only one elm:Diploma instance
- A Diploma Supplement Document **MAY** contain one and only one elm:Transcript instance
- A Diploma Supplement Document **MAY** contain one and only one elm:additionalInformation property
- A Diploma Supplement Document **MUST** contain one and only one elm:issueDate property

## 6. THE FUTURE OF ELM

The EU has already set up the processes for transforming European education in a 'world quality reference'. The fulfillment of this ambitious goal involves the development and adoption of instruments for the expression of the European citizens' learning, training and employment related information across the entire European Education Area. Europass constitutes an important step towards this direction. The support of the new European dimensions in HE, especially with regards to mobility schemes and integrated programs of study, curricular development, inter-institutional cooperation, training and research, can be immensely benefited from the design and development of interoperable information management systems.

Although in its first steps, the CEN/ISSS WSLT ELM project has already started to provide significant contributions towards this goal. The submission of the current outcomes as an Enquiry Draft for a European Norm (EN) on a DS interoperability specification is a considerable achievement. The specification recommendation will be completed before the end of 2009, taking into account comments from the Learning Technology communities and the National Standardization Bodies of Member States.

Sketching the broader European Learner Mobility landscape is definitely underway, involving actions ranging from the identification of priorities in the production of more standardization parts, the description of concrete business cases and mobility information services that will further enhance learner mobility within and beyond the European Higher Education Area, the constant observation of EU policies evolution and the feeding of outcomes/recommendations into policy development for further enhancing transparency information structures.

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