EXPLORING METADATA STANDARDS FOR COMPETENCE DESCRIPTIONS IN THE BUSINESS & MANAGEMENT DOMAIN

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Abstract

This paper explores the development and use of competency metadata standards. As there has recently been a surge of a number of standards to address the challenge of representing competencies and there is a rising need to develop a common methodology, as well as methods and tools for developing, reusing, adapting, integrating such standards, this research is now becoming important and timely. We explore this within the context of the OpenScout project, which is building a federation of repositories with content in the areas of business and management. Thus this study is limited to metadata standards for competencies in the business and management fields, but it is aimed that the lessons from this domain can transfer to other fields and will inform the wider debate on the development and use of such standards. The paper revisits a set of standards for competence descriptions and provides recommendations as to which standard would suit better the nature of the repository, the requirements of stakeholders, and the Open Content resources. In particular, the paper proposes an adaptation and extension of the IEEE-RCD model, employing an application profiling approach, and taking into account the granularity of the European Qualifications Framework and the requirements of Open Content resources.

Keywords: Open Content, Open Learning Resources, metadata standards, competency standards, competence standards, IEEE-RCD metadata model

1. INTRODUCTION

The topic of competences has a long tradition in the domain of business and management education and several competence models have been proposed in the literature. A competence is the effective performance in a domain at different levels of proficiency. They are used by educational institutions to determine whether a person has a particular level of ability or skill. The ability to formulate, describe and provide competence services to different audiences of users is particularly important for the development of eContent-based infrastructures such as electronic repositories. This facilitates users' access to relevant information. Given the diversity of repositories and possibilities to implement competence services, suitable standards are needed to implement competence services successfully. Currently there is a shortcoming of suitable competence standards therefore there is a need to develop new specifications to bridge that gap. There has recently been a proliferation of standards to address the challenge of representing competencies in diverse fields of human endeavour

and enterprise, as well as in different domains of knowledge. The debate on the selection and use of competency metadata standards and the best practice in adopting such standards is now under way in a wide range of professional and academic domains – see, for example, current efforts in the medical field (Rao et al., 2011). The need to develop a common methodology, as well as methods and tools for developing, reusing, adapting, integrating such standards, is now becoming more and more relevant and timely.

In this paper we explore standards for competencies in the business and management fields. We explore this within the context of the OpenScout project (2009) which is building a federation of repositories with content in the areas of business and management. We suggest that competencies need to be formulated in flexible ways. This flexibility includes the support of different ways for competence descriptions, alternative ways to describe competence related information by users (e.g. purpose tagging) and alternative representations of competence related information (e.g. via lists of formulated problems).

This paper is organised as follows. First we introduce the OpenScout project and its objectives. We then revisit set of standards for competence descriptions for OpenScout. We conclude with recommendations as to which standard would suit better the nature of the repository, the requirements of stakeholders and the Open Content resources.

2. BACKGROUND: THE OPENSCOUT PROJECT

Currently there is an ever growing need for management education and related content in all education segments and application fields. A large amount of open educational resources on management topics is already available, but this open content is significantly underused in the business sector, and in particular by small and medium enterprises (SMEs). Even though there is a lot of initial material for learning and training purposes on the Internet, only very few users take time and interest in (work on) localizing, improving or adapting those materials.

OpenScout seeks accelerating the use, improvement and distribution of open content in the field of management education. OpenScout is building a federation of repositories with content in the areas of business and management that aims to facilitate development of competences in individuals. As part of the development, the project has included competence in the description of two types of elements: learning objects and competence-search services.

One of the aims of OpenScout is to provide federated, skill-based search and retrieval web services within LCMS systems and Web 2.0 social network platforms to end users to support of users to improve existing and generate new contents. The searched and retrieved content will originate from a large pool of different content repositories, will be of various types, and will be used in a number of ways, either as part of formal learning scenarios or as informal learning content offered directly to end users. The main user audience of the project are small and medium enterprises (SMEs) as well as educational institutions. The focus is on enabling continuous SME training via the provision of skill-based search of content.

3. METADATA STANDARDS FOR COMPETENCE DESCRIPTIONS

The following are relevant standards for OpenScout:

3.1 IEEE LOM Competency Metadata

Learning Object Metadata (LOM) is a conceptual metadata schema that describes formally learning objects. In this Standard, a learning object is defined as any entity that may be used for learning, education or training. The LOM metadata elements are classified into nine categories: general, life cycle, meta-metadata, technical, educational, rights, relation, annotation, and classification. LOM allows linguistic diversity of both learning objects and the metadata instances that describe them. However, the LOM metadata specification does not support description of learning resources in terms of competency. Sampson & Fytros (2008) proposed a LOM-based competence application profile that can be used for tagging learning resources with competency-relevant information. Basically, a "competence" value can be introduced into the 9th category of LOM (9:Classification) to indicate the attainment of a particular competence (see also Sampson 2009).

3.2 IEEE Reusable Competency Definition (RCD)

IEEE Reusable Competency Definitions (RCD) is an international standard that formally defines key competency characteristics and aims to increase the interoperability of competency-based learning services and facilitate the description, referencing and sharing competency ontologies. This standard is supported by the Learning Technology Standards Committee of the IEEE Computer Society that defines a data model for IEEE-RCD conforms to the existing IMS specification entitled Reusable Definition of Competency or Educational Objective (IMS-RDCEO). It reuses some elements of the IEEE LOM standard. IEEE-RCD does not specify a particular extension mechanism, and does not specify any XML-binding for the data model, but the model can be referenced by other standards, and appropriate bindings can be defined for extension or interoperability purposes. The iCOPER *e*Content*Plus* project (2008) has adopted an application profile of this standard. The IEEE-RCD model does not differentiate between skills, knowledge, abilities, or attitudes. The value domains of this standard are not selected from other ontologies.

3.3 HR XML

HR-XML is an international standard for the formal description of competencies and learning outcomes. It is developed and supported by HR-XML Consortium, which is a membership only organisation. The objective of this standard is to create an XML schema in order to provide businesses and workers with a standardized way of exchanging information about competencies across different business contexts. The HR-XML competency schema has been introduced as a part of the broader process-oriented HR schema, and includes information on (a) evidence of competency and (b) levels of competency. HR-XML is suitable for the purposes of comparing, measuring and matching of competencies (for example matching workers' competencies with job descriptions), classifies competences in terms of skills, knowledge and attitudes, and supports recursive/hierarchical definition of competences. The bindings of the HR-XML competency standard are in XML schema format. The standard is a non-extensible standard that does not allow addition of values from other schemas/ontologies. HR-XML offers interoperability with proprietary ERP/HR systems such as ADP, Lawson, Oracle and SAP. This metadata schema also enables mappings between different taxonomies of competences.

The HR-XML competency model meets the following requirements:

- To be simple, compact, and sufficiently flexible and generalized, so that the model is not prohibitively complex and is useful within a variety of business contexts.
- To provide "structure to enable easy comparison, ranking, and evaluation of competencies.
- To be capable of referencing a variety of competency taxonomies.

3.4 IMS Metadata Standards: IMS Learning Design (IMS LD) & RDCEO

IMS-LD is an international standard which formally describes learning processes. "The IMS Learning Design has many advantages and "aims to represent the learning design of units of learning in a semantic, formal and machine interpretable way" (Koper 2005). It is mainly centred on outcomes/performance and is focused on defining personal learner/teacher roles, learning objects, and learning processes/activities. IMS-LD has a hierarchy of three levels, known as Level A, Level B, and Level C, with separate XML schemas provided for each level and higher levels incorporating fully the lower levels:

- Level A contains activities, environments, plays, acts, roles, services, etc.
- Level B contains all elements of Level A, and new elements which enable personalization and more elaborate sequencing and interactions based on learner portfolios.
- Level C contains all elements of Level B and a new element facilitating a Notification Service.

IMS LD takes other existing specifications into account (Jeffery 2003). The following standards relate to IMS LD:

- IMS Learning Resource Meta-data / IEEE Learning Object Metadata – IMS Learning Design includes placeholders for metadata in its structures.
- IMS Reusable Definition of Competency or Educational Objective (RDCEO) –Relevant elements in IMS Learning Design, such as learning objectives, can reference resources defined by this specification.
- IMS Enterprise can be used for mapping learners and staff to IMS Learning Design roles in certain circumstances.

In particular, the RDCEO specification of IMS provides a means to formally create and describe common descriptions of competencies, conceptualized in a very general sense that includes skills, knowledge, and learning outcomes. This model represents generic characteristics of a competency, independent of any particular context, and thus enables interoperability of competence descriptions among diverse communities, learning systems and tools. Furthermore, IMS-RDCEO can support user-defined models of competence descriptions. Finally, the IMS- RDCEO specification provides XML bindings in XML format.

3.5 The European Model of Learner Competences (EMLC)

This data model was developed as a standard by CEN WS-LT, to be used and provide interoperability of competency definitions across Europe. More particularly, this model is designed to serve as a universal competency definition model and its purpose is to enable the creation, exchange and reuse of competency definitions among interoperable systems and in this way to support of intra and inter-organisational activities across Europe.

The standard is built based on an extended/enhanced application profile of the IMS RDCEO specification, in order to facilitate the creation of competency repositories within a European context. It is specifically designed to be aligned with the single framework for the transparency of qualifications and competencies (Europass), which defines new information models for the description of skills, competences, qualifications, and experience of trans-national mobility.

4. OTHER INITIATIVES

4.1 Personal Accomplished Learning Outcomes (PALO)

The Personal Achieved Learning Outcomes (PALO) standard provides a simple model for formally capturing and describing information on knowledge, skills and competences. PALO also incorporates

context-specific and evidence-related information, relevant to the learning process or the learning outcomes. The PALO standard aims at promoting the exchange and interoperability of competency-based information between different learning management systems, e-portfolios, HRIS systems, and social web tools. Thus, PALO describes information about competency, as well as levels and ranking of attained competencies or achieved learning outcomes. The PALO data model has adopted data elements and concepts from other specifications such as:

- IEEE RCD and ICOPER LOD, which focus more on describing the characteristics of learning outcomes.
- HR-XML, which mainly focuses on describing evidence of competency attainment and learning outcome achievement.

4.2 CEN Metadata for Learning Opportunities (MLO)

Metadata for Learning Opportunities (MLO) is an international standard for describing learning opportunities. It is developed and supported by CEN/ISSS WS-LT. The standard defines the electronic representation of learning opportunities and aims to facilitate the offering/promotion of learning opportunities, to provide information to prospective learners about learning opportunities and to enable them to make informed decisions about their learning options and locate/access suitable opportunities. The MLO standard is a lightweight model, aimed at European SMEs, which can be integrated with various learning systems and tools. The metadata elements of the MLO model are according to the ISO 15836:DC 1.1 schema. The value domains are taken from the Dublin Core Abstract Model (DCAM). Extension of the MLO standard is done by inclusion of various properties, vocabulary encoding schemas and syntax encoding schemas. The MLO standard provides XML bindings in RDF and XML format. The MLO does not deal with competencies, but only with learning opportunities, so competency profiles are not included in this model.

4.3 The European Learner Mobility Model

This data model is currently in the form of guidelines and in the process of being developed by CEN TC353 as a standard to be used and provide interoperability across Europe. The purpose of the model is to enable the expression and exchange of European Learner Mobility information as defined by the European transparency instruments. This data model supports the interoperability of EU systems that manage and exchange Europass related information. The model builds on existing learning technology specifications and takes into account related national application profiles.

It is basically an extension of the EMLC model; it focuses on the experience of mobility of learners and includes a special section on Intended Learning Outcomes. On the Learner side, a central feature is the Diploma Supplement (ELM DS), while the domain of employers is also covered by other standards, such as HR-XML.

In this model, the Diploma Supplement plays a key role in enabling the transparent interpretation and recognition of educational and training qualifications across Europe. It aims to address the need for interoperable tools that allow the reuse of data in producing electronic Diploma Supplements. This model serves as a methodological framework for the development of an interoperable specification for the Europass DS.

Similarly to the EMLC, EuroLM DS employs “application profiling” (a kind of bespoke packaging) and re-uses a selective set of existing schemas (such as the Metadata for Learning Opportunities - Advertising (MLO-AD) and its ECTS refinements), including the specification of an existing Educational Credit Information Model, as well as embedded DC and vCard elements.

5. SELECTING A COMPETENCY METADATA STANDARD FOR OPENSCOUT

From the above review it is clear that there is no one standard that could cover all the important dimensions of the OpenScout requirements in terms of a common "univocal" competence model. OpenScout will need to define a generic competence model, which meets all the user requirements and includes all the important dimensions of competence. In particular, with regard to HR-XML or IMS-RDCEO, one can identify the following shortcomings (Sampson et al. 2007):

1. The concept of competency itself is not detailed in terms of knowledge, skills, and attitudes.

2. Levels can be both qualitative and quantitative, but there is no formal way to systematize them, as, for example, in the European Qualifications Framework (EQF).

3. They fail to deal with "context", although it is an important dimension related to competence definition.

The shortcomings above are gaps of representation and fall clearly outside of the scope of these two standards. Therefore they are not suitable to address the needs of OpenScout. One of the main objectives of OpenScout is to provide interoperability between different competence descriptions, to address the challenge of heterogeneous data models and standards that different communities use to describe competency-related information.

The European Model of Learner Competences is a capable, interoperable standard for expressing competences in a transparent way, addressing the needs of both learners and organisations. However, it is heavily based on IMS-RDCEO and therefore exhibits the first two above shortcomings, while the context is well defined in this case as it mostly focused on the qualification domain, and particularly the Europass transparency framework. The emerging EuroLM standard, currently under development by CEN WS-LT, has similar strengths as well as weaknesses, as it is focused mainly on qualification transparency and experience of learner mobility.

6. CONCLUSION

Based on the above analysis we suggest an adaptation and extension of the IEEE-RCD model, employing an application profiling approach, and taking into account the granularity of the European Qualifications Framework and the requirements of Open Content resources. This development should use similar methods and processes to those of the related iCOPER PALO and the IEEE LOM competency metadata standards, as well as the EMLC standard (mainly for the qualification side).

The OpenScout schema should include competency data elements that are related to (a) personal characteristics and evidence of individual performance/output, (b) generic job characteristics/requirements, and (c) contextual job characteristics (context) – see (Prins et al. 2008). The schema will also need to cater for the specific needs of the management/business education communities and support user tagging / folksonomies as these Web 2.0 features are also part of the OpenScout portal.

Future research directions will focus on the interoperability of the various competency metadata standards and their use across different domains of knowledge. It will be interesting ad useful to see whether and how the developed OpenScout schema can be of use in other contexts and how it could inform medatata model development in other areas and contribute to wider standardisations efforts.

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