Lifelong Competence Development: Towards a Common Metadata Model for Competencies Description – The Case Study of Europass Language Passport

Pythagoras Karampiperis, Demetrios Sampson, Demetrios Fytros

Department of Technology Education and Digital Systems, University of Piraeus, Greece

&

Advanced e-Services for the Knowledge Society Research Unit, Informatics and Telematics Institute, Centre for Research and Technology Hellas, Greece

e-mail:{pythk, sampson, dfytros}@iti.gr

Abstract

Competence-based approaches in the field of formal or non-formal education and training are becoming more common and appear to offer the opportunity to develop programmes that meet needs of learners, trainers and potential employers. To support the provision of competence-based learning services, it is necessary to maintain a record of an individual's competences in a persistent and standard way. In this paper, we investigate the problem of defining a common metadata model for the description of competencies based on the application of the current state-of-the-art specification (namely, the IMS RDCEO) in describing competencies, in a real case study, that is, the EuroPass Language Passport. To this end, we identify four open issues on the description capabilities of the IMS RDCEO specification, and propose possible extensions to its information model, demonstrating their application in practice.

1. Introduction

Competence-based approaches in the field of formal or non-formal education and training are becoming more common and appear to offer the opportunity to develop programmes that meet needs of learners, trainers and potential employers [1, 2, 3, 4 and 5]. Competence is defined as the integrated application of knowledge, skills, values, experience, contacts, external knowledge resources and tools to solve a problem, to perform an activity, or to handle a situation [6, 7]. In order to provide competence-based learning services, it is necessary to maintain a record of an individual's competences in a persistent and standard way [8, 9], so as to ensure that learners can find learning activities that fit and improve their acquired competences. Therefore, a common agreed model for describing competencies is required [10].

In this paper, we investigate the problem of defining a common metadata model for the description of competencies based on the application of the current state-of-the-art specification (namely, the IMS RDCEO [11]) in describing competencies, in a real case study, that is, the EuroPass Language Passport. To this end, we identify four open issues on the description capabilities of the IMS RDCEO specification, and propose possible extensions to its information model. The paper is structured as follows: First, we present and discuss the current state-of-the-art specifications for describing competencies, identifying open issues related with their expression capacity. In Section 3, we present our proposed approach and demonstrate its use in a real case study, namely, the EuroPass Language Passport. Finally, we discuss our findings and the conclusions that can be offered.

2. Description model for competencies

In order to support and use effectively the link between competence and education, there is need to provide reusable definitions of competences, across the different systems [10]. Description models for competences, such as the IEEE Reusable Competency Definition (IEEE RCD) [12] and the IMS Reusable Definition of Competency or Educational Objective (IMS RDCEO) [11] specification, are coming to provide a solution to this problem.

The IMS RDCEO specification defines an information model for describing, referencing, and exchanging definitions of competencies, primarily in

Proceedings of the Sixth International Conference on Advanced Learning Technologies (ICALT'06)
0-7695-2632-2/06 $20.00 © 2006 IEEE

the context of online and distributed learning. This specification, aims to provide the means for formally representing the key characteristics of a competency, independently from its use in a particular context. Hence, it aims to guarantee interoperability among e-training systems that deal with competency information, by allowing them to refer to common definitions with commonly recognized values. On the other hand, the IEEE RCD specification describes a Competency Definition as used in a Learning Management System or referenced in a Competency Profile, by making direct reference of the IMS RDCEO specification.

Based on the description capacity of the IMS RDCEO specification, we have identified the following open issues:

a. *How to represent the level of a competency*? The IMS-RDCEO specification supports the representation of a competency level, within the 'title' element. The information stored within this element is in a narrative format, thus, it is not machine understandable and limits the scope of interoperability among different systems.
b. *How to represent the grading scale of a competency*? The IMS-RDCEO specification does not provide a way to represent the "grading scale" of a competency, thus, provides limited support for the assessment of complex competencies.
c. *How to represent the success threshold of a competency*? The IMS-RDCEO specification does not support the definition of a "success threshold" for a competency. Therefore, a learning system cannot interpret the existence of a competence.
d. *How to describe complex competencies in an interoperable way*? The IMS-RDCEO already supports the definition of complex competencies (that is, any competency consisting of other – simple or complex – competencies) through the use of 'metadata/relation' element. However, it does not provide a way to represent the weighting factor of sub-competencies when assessing a complex one, thus, provides limited support for the assessment of complex competencies.

3. The case ctudy of EuroPass Language Passport

The Europass Language Passport, a European common model for language competencies, was developed by the Council of Europe as part of the European Language Portfolio [13]. It supports the definition of individuals' language skills on a six-level scale and it was designed to enhance the motivation of individuals to improve their ability of communicating in different languages.

The EuroPass Language Passport defines a competence ontology consisting of 5 simple competencies and 3 complex competencies. Each of these competencies is associated (directly or indirectly) with a list of language topics (see Fig. 1).

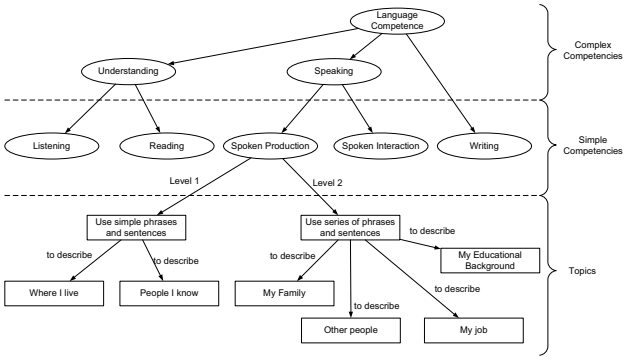

Figure 1: Partial view of competence ontology used in euroPass language passport

In this paper, we use the Europass Language Passport as an example of the open issues recognized in previous section. For each open issue, we provide an example of the existing support that the IMS RDCEO specification offers, we present our extension proposal and demonstrate its use in practice.

3.1 How to represent the level of a competency?

The Europass Language Passport defines common reference levels for the description of language proficiency levels based on a six level scale retrieved from the Common European Framework of Reference for Languages [14]. These levels are: level A1 and A2 for basic users, level B1 and B2 for independent users and level C1 and C2 for proficient users. The below example illustrates the use of IMS RDCEO specification in expressing A1 Level of the Reading Language Skill.

```
. . .
<title>
        <langstring xml:lang="en">European A1 Reading
Language Skill</langstring>
</title>
<description>
        <langstring xml:lang="en">Can understand familiar
names, words and very simple sentences, for example on
notices and posters or in catalogues</langstring>
</description>
. . .
```

As it is shown, the IMS RDCEO specification allows the description of the proficiency level via the

'title' element, which does not discriminate the narrative description of the name from the level of the described competency. A possible solution to this problem is the addition of two new elements, namely, the 'level' and the 'value' element, under the 'description' element of the IMS RDCEO specification. The "description/level" element aims to provide the space for describing the level of the competency and the "description/value" element aims to provide the space for the narrative description of the competency. The proposed new elements are depicted in Table 1.

Table 1: Representing the level of a competency

No	Name	Explanation	Reqd	Mult	Value Space	Datatype	Notes
3	Description	Description of the Competency or Educational Objective	O	Single			
3.1	**Value**	**The actual Description of the Competency or Educational Objective**	**O**	**Single ***		**LangString (smallest permitted maximum: 2000 characters)**	**Example: "Proficiency in written and spoken English and use of English for meaningful oral or written expression."**
3.2	**Level**	**The proficiency level of the Competency or Educational Objective**	**O**	**Single ***		**LangString (smallest permitted maximum: 2000 characters)**	**Example: "A1 Level"**

Following the proposed extensions the above mentioned example of expressing A1 Level of the Reading Language Skill takes the following form:

```
. . .
<title>
    <langstring xml:lang="en">European Reading Language
Skill</langstring>
</title>
<description>
    <value>
        <langstring xml:lang="en">Can understand familiar
names, words and very simple sentences, for example on
notices and posters or in catalogues</langstring>
    </value>
    <level>
        <langstring xml:lang="en">A1 Level</langstring>
    </level>
</description>
. . .
```

3.2 How to represent the grading scale of a competency?

The Europass Language Passport also defines grading scales for the above mentioned common reference competence levels, to support the assessment of each language proficiency level. This scale is numeric taking values from 1 to 10. The below example illustrates the use of IMS RDCEO specification in describing A2 Spoken Production Language Skill.

As we can see below, the IMS RDCEO specification does not allow the definition of the grading scale of a competency.

```
. . .
<title>
    <langstring xml:lang="en">European A2 Spoken Production
Language Skill</langstring>
</title>
<description>
    <langstring xml:lang="en">Can use a series of phrases
and sentences to describe in simple terms my family and
other people, living conditions, my educational background
and my present or most recent job</langstring>
</description>
. . .
```

A possible solution to this problem is the addition of a new element, namely, the 'scale' element, under the 'description' element of the IMS RDCEO specification. This new element consists of two sub-elements, namely, the 'minvalue' sub-element that represents the minimum value of the scale and the 'maxvalue' sub-element that represents the maximum value of the scale. The proposed new elements are depicted in Table 2.

Table 2: Representing the grading scale of a competency

No	Name	Explanation	Reqd	Mult	Value Space	Datatype	Notes
3	Description	Description of the Competency or Educational Objective	O	Single			
3.1	Value	The actual Description of the Competency or Educational Objective	O	Single *		LangString (smallest permitted maximum: 2000 characters)	Example: "Proficiency in written and spoken English and use of English for meaningful oral or written expression."
3.2	Level	The proficiency level of the Competency or Educational Objective	O	Single *		LangString (smallest permitted maximum: 2000 characters)	Example: "A1 Level"
3.3	**Scale**	**The grading scale of the Competency's level**	**O**	**Single**			
3.3.1	**Minvalue**	**The minimum value of the scale**	**O**	**Single**		**#PCDATA Integer in the range 1 to 100**	**Example: "1"**
3.3.2	**Maxvalue**	**The maximum value of the scale**	**O**	**Single**		**#PCDATA Integer in the range 1 to 100**	**Example: "10"**

Following the proposed extensions the above mentioned example of expressing A2 Spoken Production Language Skill takes the following form for the scale taking values from 1 to 10:

```
. . .
<title>
    <langstring xml:lang="en">European Spoken Production
Language Skill</langstring>
</title>
<description>
    <value>
        <langstring xml:lang="en">Can use a series of
phrases and sentences to describe in simple terms my family
and other people, living conditions, my educational
background and my present or most recent job</langstring>
    </value>
    <level>
        <langstring xml:lang="en">A2 Level</langstring>
    </level>
    <scale>
        <minvalue>1</minvalue>
        <maxvalue>10</maxvalue>
    </scale>
</description>
. . .
```

3.3 How to represent the success threshold of a competency?

As it was already mentioned, the Europass Language Passport defines a grading scale from 1 to 10 for each language proficiency level recognized. Additionally, the Europass Language Passport defines for each language proficiency level a threshold on this scale that indicates the existence of the relevant competency. This threshold has been defined equal to 3. Again the IMS RDCEO specification does not allow the definition of the success threshold of a competency (see also previous example).

A possible solution to this problem is the addition of a new element, namely, the 'threshold' element, under the 'description' element of the IMS RDCEO specification. The proposed new elements are depicted in Table 3.

Table 3: Representing the success threshold of a competency

No	Name	Explanation	Reqd	Mult	Value Space	Datatype	Notes
3	Description	Description of the Competency or Educational Objective	O	Single			
3.1	Value	The actual Description of the Competency or Educational Objective	O	Single *		LangString (smallest permitted maximum: 2000 characters)	Example: "Proficiency in written and spoken English and use of English for meaningful oral or written expression."
3.2	Level	The proficiency level of the Competency or Educational Objective	O	Single *		LangString (smallest permitted maximum: 2000 characters)	Example: "A1 Level"
3.3	Scale	The grading scale of the Competency's level	O	Single			
3.3.1	Minvalue	The minimum value of the scale	O	Single		#PCDATA Integer in the range 1 to 100	Example: "1"
3.3.2	Maxvalue	The maximum value of the scale	O	Single		#PCDATA Integer in the range 1 to 100	Example: "10"
3.3.3	**Threshold**	**The value of the scale**	**O**	**Single**		**#PCDATA Integer in the range 1 to 100**	**Example: "5"**

Following the proposed extensions, we provide below an example of expressing A1 Writing Language Skill with scale taking values from 1 to 10 and threshold defined equal to 3.

```
. . .
<title>
    <langstring xml:lang="en">European Writing Language
Skill</langstring>
</title>
<description>
    <value>
        <langstring xml:lang="en">Can write a short, simple
postcard, for example sending holiday greetings. Can fill in
forms with personal details, for example entering my name,
nationality and address on a hotel registration
form</langstring>
    </value>
   <level>
        <langstring xml:lang="en">A1 Level</langstring>
    </level>
    <scale>
        <minvalue>1</minvalue>
        <maxvalue>10</maxvalue>
    </scale>
    <threshold>3</threshold>
</description>
. . .
```

3.4 How to describe complex competencies in an interoperable way?

The IMS-RDCEO already supports the definition of complex competencies through the use of 'Metadata/Relation' element. However, it does not provide a way to represent the weighting factor of sub-competencies when assessing a complex one. A possible solution to this problem is the addition of a new element, namely, the 'weight' element, under the 'Metadata/Relation/Kind' sub-element of the IMS RDCEO specification. This element represents the weighting factor (importance) of a specific competency when it is aggregated within a more complex one. The proposed extension is depicted in Table 4.

Table 4: Describing complex competencies

No	Name	Explanation	Reqd	Mult	Value Space	Datatype	Notes
	{Additional Metadata}	Additional embedded Metadata describing this RDCEO	O	Multiple	The information contained in this section is defined by the IMS Metadata specification.	Smallest permitted maximum 10	See Best Practice document guidance for Metadata records
7	Relation	This category defines the relationship between this Competency and the "Child" Competencies, if any	O	Multiple		smallest permitted maximum: 100 items	
7.1	Kind	Nature of the relationship between this Competency and the "Child" Competencies	O	Single	Consists Of Is Part Of	Vocabulary	
7.2	**Weight**	**The importance of the 'Child' Competency**	**O**	**Single**		**#PCDATA Float in the range 0 to 1**	**Example: "0,7"**

The below example illustrates the use of IMS RDCEO specification in describing "Understanding" competence as a synthesis of "Listening" and "Reading" competencies (see also Figure 1). In this example, the importance of listening skill is defined equal to 0.4 in a scale from 0 to 1 and the importance of reading skill is defined equal to 0.6 in the same scale.

```
. . .
<title>
    <langstring xml:lang="en">European Understanding Language
Skills</langstring>
</title>
<description>
    <langstring xml:lang="en">……</langstring>
</description>
<definition>
    <model>http://culture2.coe.int/portfolio/documents/052180
3136txt.pdf</model>
    <statement statementid="1" statementname="Content Area">
        <statementtext>
            <langstring xml:lang="en">Language
```

```
Skills</langstring>
        </statementtext>
    </statement>
</definition>
<metadata>
    <rdceoschema>IMS RDCEO</rdceoschema>
    <rdceoschemaversion>1.0</rdceoschemaversion>
    <lom>
        <relation>
            <kind>
                <source>LOM v1.0</source>
                <value>Consists of</value>
            </kind>
            <weight>0,4</weight>
            <resource>
                <identifier>
                    <catalog>URL</catalog>
                    <entry>……</entry>
                </identifier>
                <description>
                    <langstring xml:lang="en">European
Listening Language Skill</langstring>
                </description>
            </resource>
        </relation>
        <relation>
            <kind>
                <source>LOM v1.0</source>
                <value>Consists of</value>
            </kind>
            <weight>0,6</weight>
            <resource>
                <identifier>
                    <catalog>URL</catalog>
                    <entry>……</entry>
                </identifier>
                <description>
                    <langstring xml:lang="en">European
Reading Language Skill</langstring>
                </description>
            </resource>
      </relation>
                        . . .
```

4. Conclusions and future work

In this paper, we investigate the problem of defining a common metadata model for the description of competencies based on the application of the current state-of-the-art specification (namely, the IMS RDCEO) in describing competencies, in a real case study, that is, the EuroPass Language Passport. To this end, we identify four open issues on the description capabilities of the IMS RDCEO specification, and propose possible extensions to its information model, demonstrating their application in practice.

Future work, includes the application of the proposed extensions of the IMS RCDEO specification in the description of other competence models (i.e. the EuroPass Curriculum Vitae), so as to verify the generality of the proposed extensions. Additionally, in our future work we will investigate how other models than competence models (i.e. human resources description models) could contribute towards defining a common metadata model for competencies.

5. Acknowledgements

The work presented in this paper is partially supported by European Community under the Information Society Technologies (IST) programme of the 6th FP for RTD project TenCompetence contract IST-027087.

References

[1]. Field, J. Lifelong education. International Journal of Lifelong Education, vol. 20(1/2), (2001), pp. 3-15.

[2]. Aspin, D. N. and Chapman, J. D. Lifelong learning: concepts and conceptions. International Journal of Lifelong Education, vol. 19(1), (2000), pp. 2-19.

[3]. Gonczi A. Competency-based Learning: A Dubious Past - An Assured Future? In Boud, D. and Garrick, J. (Eds) Understanding Learning at Work, London Routledge, (2000), pp. 188-196.

[4]. Lucia. A. and Lepsinger, R. The What, Why and How of Competency Models. In Lucia. A. and Lepsinger, R. (Eds) The Art and Science of Competency Models: Pinpointing Critical Success Factors in Organizations. San Francisco, CA: Jossey-Bass, (1999), pp. 1-20.

[5]. Koper, R. and Tattersall, C. New directions for lifelong learning using network technologies. British Journal of Educational Technology, vol. 35(6), (2004), pp. 689-700.

[6]. Friesen, N. and Anderson, T. Interaction for lifelong learning. British Journal of Educational Technology, vol. 35(6), (2004), pp. 679-687.

[7]. Sandberg, R. Competence - the Basis for a Smart Workforce. In Gerber, R. and Lankshear, C. (Eds) Training for a Smart Workforce, London Routledge, (2000), pp. 47-72.

[8]. Griffin, C., Lifelong learning and social democracy. International Journal of Lifelong Education, vol. 18 (5), (1999), pp. 329-342.

[9]. Williamson, K., Bannister, M. and Schauder, D. Developing an interpretative approach to competency-based training and learning. Australian Academic and Research Libraries, vol. 34(2), (2003). Available online at: http://alia.org.au/publishing/aarl/34.2/full.text/williamson.html

[10]. CEN/ISSS CWA15455, The European Model for Learner Competencies (2005) Available Online at: http://www.ni.din.de/sixcms/detail.php?id=6988

[11]. IMS RDCEO (2002), IMS Reusable Definition of Competency or Educational Objective, Available Online at: http://imsglobal.org/competencies/index.cfm

[12]. IEEE P1484.20/D01 (2004), Draft Standard for Information Technology – Learning Technology – Competency Definitions, Available Online at: http://ltsc.ieee.org/wg20/files/IEEE_RDCEO_Spec.pdf

[13]. EC. European Language Portfolio, Available Online at: http://culture2.coe.int/portfolio/

[14]. EC. Common European Framework of Reference for Languages, (2001). Available online at: http://www.coe.int/T/E/Cultural_Co-operation/education/Languages/