



# Refinement and Optimization of adapted eco-tools



<http://www.competencetools.eu>

Dissemination Level: Public



Education and Culture DG

Lifelong Learning Programme



## **AT A GLANCE:**

### **Project – Coordinator**

Christian M. Stracke  
University of Duisburg-Essen  
[christian.stracke@icb.uni-due.de](mailto:christian.stracke@icb.uni-due.de)

### **Project Officers**

Monika Holik (HoU, EC)  
Pavol Krempasky (EC)

### **Partners**

Germany:

- University of Duisburg-Essen
- Federal Institute for VET (BIBB)

Greece:

- Medit. Agron. Institute of Chania
- ELOT - Hellenic Standardization
- Agro-Know Technologies

Czech Republic:

- Institute of Agric. Economics + Inf.

Slovenia:

- Chamber of Agriculture, Forestry

Italy:

- Institute for Vocational Training
- KION SpA

United Kingdom:

- University of Bolton

### **Duration**

24 months

### **URL**

[www.competencetools.eu](http://www.competencetools.eu)

## **Project and Deliverable Outline:**

### **What is the focus of eCOTOOL?**

The overall objective of eCOTOOL is to improve the development, exchange, and maintenance of VET certificates and their accessibility and transparency by harmonizing Europass with other European instruments (EQF, ECVET) and e-competences.

### **What is the focus of this Deliverable?**

This document describes the final output of refined and optimized adapted eCOTOOL tools.

### **What are the benefits of this Deliverable?**

This document provides the final considered eCOTOOL project insights into how the eco-tools can be adapted to the agricultural sector.

### **How to use this Deliverable?**

This document can be used by those in the agriculture sector as the basis for developing further tools to deal with skills and competences within the sector. It can also be used by other sectors with appropriate consideration of the necessary changes from agriculture.

### **What is the relationship to other deliverables and work packages?**

This document reflects on the tool deliverables from WP1 and WP2 and draws conclusions relevant to their adaptation to agriculture.

### **Conclusions and recommendations**

The adaptation of the tools to agriculture demonstrates in prototype that the tools can be adapted to any occupational field. Though refinement and optimization does fit the tools to agriculture better, it also provides a clearer path to adapting them to other sectors.

## Document Information:

<b>Project name</b>	eCOmpetences TOOLS
<b>Acronym</b>	eCOTOOL
<b>Project number</b>	504614 - LLP - 1 - 2009 - DE - Leonardo - LMP
<b>Project URL</b>	<a href="http://www.competencetools.eu">www.competencetools.eu</a>
<b>EC Project Officers</b>	Monika Holik (EC) Pavol Krempasky (EC)

<b>Document title</b>	"eCOTOOL_Refinement_of_adapted_tools.pdf"
<b>Deliverable</b>	D3.5 "Refinement and Optimization of adapted eco-tools"
<b>Deliverable coordinator</b>	University of Bolton, UK
<b>Work Package</b>	WP3 "Analysis of Agriculture VET Requirements and Adaptation of Europass CS eco-tools"
<b>Work Package coordinator</b>	MAICh

<b>Security (dissemination level)</b>	Public	
<b>Date of delivery</b>	<b>Contractual</b>	2011-10-31
	<b>Actual</b>	2011-11-30
<b>Document type</b>	Deliverable	
<b>Version number and status</b>	final	
<b>Number of pages</b>	38	
<b>WPs contributing to the document</b>	3	

<b>Keywords</b>	application profile, XML
-----------------	--------------------------

<b>Abstract (for external dissemination)</b>	<p>The refined and optimised adaptation of the "eco-tools" shows how not only the Europass Certificate Supplement information, but also the related competence information can in practice be represented, for portability, transfer, and interoperability.</p> <p>The work is ready to be passed on to other projects and initiatives for further work related to information about competence in general, and to facilitate implementation, maintenance, exchange and harmonization of Certificate Supplements, not only in the agricultural sector, but any sector.</p>
--	--



<b>Authors / Reviewers / Contributors of this Document</b>			
<b>Name</b>	<b>Organization</b>	<b>Country</b>	<b>Role</b>
Simon Grant	University of Bolton (Bolton)	UK	Author
Chiara Carlino	KION	IT	Contributor
Carolyn Owen	MAICh	GR	Reviewer/Editor

## Change history:

Version	Date	Author / Contributor	Description / Comments
1	2011-11-05	Simon Grant	Initial development of the whole document
2	2011-11-23	Simon Grant	adding in example XML
3	2011-11-25	Simon Grant	slight rearrangement of ECS AP
4	2011-11-26	Simon Grant	inclusion of XSDs
4	2011-11-27	Carolyn Owen	copy editing improvements

Final Document	
<b>File name of the final document</b>	"D3_5_eCOTOOL_Refinement_of_adapted_tools.pdf"
<b>Approval by the WP coordinator</b>	Carolyn Owen (MAICh)- Approved -
<b>Approval by the project coordinator</b>	Christian M. Stracke, University of Duisburg-Essen, Germany - Approved

## Revision history after submission (if any):

Revision	Date	Reviser	Description / Comments
[number]			

Final Document of this Revision	
<b>File name of the revised document</b>	"Revised_Document_Title.pdf"
<b>Approval by the WP coordinator</b>	-
<b>Approval by the project coordinator</b>	[Name] - Not yet approved -

## Project Consortium Information:

Partner and Acronym		Contact
<b>University of Duisburg-Essen (Coordinator)</b> <b>UDE</b>		<b>Christian M. Stracke</b> <a href="mailto:christian.stracke@uni-due.de">christian.stracke@uni-due.de</a>
<b>Federal Institute for Vocational Education and Training</b> <b>BIBB</b>		<b>Dagmar Winzier</b> <a href="mailto:winzier@bibb.de">winzier@bibb.de</a>
<b>Mediterranean Agronomic Institute of Chania</b> <b>MAICh</b>		<b>Yannis Livieratos</b> <a href="mailto:livieratos@maich.gr">livieratos@maich.gr</a>
<b>ELOT - Hellenic Organization for Standardization</b> <b>ELOT</b>		<b>Cleo Sgouropoulou</b> <a href="mailto:csgouro@cs.ntua.gr">csgouro@cs.ntua.gr</a>
<b>Agro-Know Technologies</b> <b>Agro-Know</b>		<b>Charalampos Thanopoulos</b> <a href="mailto:cthanopoulos@agroknow.gr">cthanopoulos@agroknow.gr</a>
<b>Institute of Agricultural Economics and Information</b> <b>UZEI</b>		<b>Lenka Fišerová</b> <a href="mailto:fiserova.lenka@uzei.cz">fiserova.lenka@uzei.cz</a>
<b>Chamber of Agriculture and Forestry of Slovenia</b> <b>KGZS</b>		<b>Aleš Tolar</b> <a href="mailto:ales.tolar@kgzs.si">ales.tolar@kgzs.si</a>
<b>Institute for the Development of Vocational Training</b> <b>ISFOL (appointed NEC)</b>		<b>Alessandra Biancolini</b> <a href="mailto:a.biancolini@isfol.it">a.biancolini@isfol.it</a>
<b>KION SpA</b> <b>KION</b>		<b>Simone Ravaioli</b> <a href="mailto:sravaioli@kion.it">sravaioli@kion.it</a>
<b>University of Bolton</b> <b>Bolton</b>		<b>Simon Grant</b> <a href="mailto:asimong@gmail.com">asimong@gmail.com</a>

## List of Acronyms and Abbreviations:

Acronym	Full name
AP	application profile
ECS	Europass Certificate Supplement
IRI	internationalized resource identifier
NACE	Nomenclature statistique des Activités économiques dans la Communauté Européenne (Statistical Classification of Economic Activities in the European Community)
URI	uniform resource identifier
XML	extensible markup language
XSD	XML schema document



# Table of Contents

<b>1. BACKGROUND .....</b>	<b>9</b>
<b>2. REFINEMENT AND OPTIMISATION OF THE APPLICATION PROFILE .....</b>	<b>10</b>
Key to the table columns.....	11
Key to background colours.....	12
2.1. The refined and optimized ECS Application Profile.....	12
Information model table .....	12
2.2. The refined and optimized competence model .....	18
Notes to the tables.....	24
<b>3. REFINEMENT AND OPTIMISATION OF XML BINDINGS .....</b>	<b>25</b>
3.1. Europass Certificate Supplement .....	25
Example XML .....	25
Refined and optimised XSD for Europass Certificate Supplement .....	28
3.2. An individual competence definition .....	33
Example XML.....	33
Refined and optimised XSD for a single competence definition.....	35
<b>4. COMMENTARY AND CONCLUSION.....</b>	<b>37</b>

# 1. Background

In Deliverable 1.2, a general Application Profile for the Europass Certificate Supplement (ECS) was presented. In Deliverable 3.3 (“D3.3”), it was shown how this might be adapted to the agricultural sector, alongside other results presented in that deliverable.

The adaptation of the Application Profile given in D3.3 covers several points.

The first point is that a sector classification is necessary to enable the distinction between different sectors, while allowing data about ECSs from different sectors to be held in the same database.

The second point is to elaborate the structure for a single learning outcome (or “ability”) to allow more adaptation to any sector. Each single learning outcome refers to one item in the ECS’s Section 3: “Profile of Skills and Competences”. For skills and competences (collectively: abilities) this involves, firstly, allowing the separate handling of an action verb, and, secondly, allowing the classification of each learning outcome. Action verbs could potentially be restricted to being taken from a sector specific vocabulary. On the other hand, knowledge items (sometimes called “underpinning knowledge”) typically do not have an action verb. D3.3 takes the view that this difference in structure merits two variant elements within the learning outcome, specifying which kind of learning outcome it is.

Each learning outcome could be classified, and the examples of classification schemes given in D3.3 are NACE Rev. 2 and AGROVOC. However as this has not been observed yet in practice, D3.3 does not elaborate it.

The third point noted in D3.3 is that the ECS section numbered “7” in the AP, titled “Entry/access requirements”. It is plausible that within a particular sector and scope or economic culture (e.g. nationally), a detailed account could be made of the relevant career structures.

On the basis of this background, work efforts have been made to refine and optimize both the application profile and the XML representation of that profile provided to illustrate a common approach to “binding” the profile to a particular representation technology.

## 2. Refinement and optimisation of the Application Profile

The adaptation work in D3.3 showed that it was possible to give more detail to the representation of skills and competences in an ECS, but the question remains whether this was necessary or desirable. Definitions of learning outcome, ability, skill and competence have multiple uses, as explained in Deliverable 1.4 (“D1.4”). The approach taken in D1.4 was to separate the model of competence from the AP for the ECS. Would this approach also be applicable when the eco-tools are adapted for a particular domain - in this case, agriculture?

Careful examination of the adaptations made to the ECS AP in D3.3 reveals that no adaptations were made for agriculture that could not equally have been made for other industries. Even the NACE coding structure is general, and not agriculture-specific. Only AGROVOC is specific to agriculture, but could be replaced by other suitable vocabularies, should the AP to be adapted other uses. What is needed is simply some extra structure to hold information that is specific to the particular occupational area in question. There are no inherent reasons why the extra structure should go directly into the ECS AP. Rather, the arguments brought out in D1.2 and D1.4 still hold, even within the domain of agriculture.

It was therefore decided that an appropriate refinement and optimization of the AP would be to split it, as the D1.4 work on the competence model was separated from the D1.2 AP. However, the two parts should remain intimately connected so that the ECS could link to any industry-specific adaptive features are given in the representation of the definition of competence itself, separately, according to the D1.4 model. In D1.4 it is merely the outline of the model that is given, not in the same form as the AP in D1.2. The natural consequence of this was, for this refinement and optimization, to provide here (in D3.5) a representation of the appropriate parts of the competence model in the same format as D1.2, and able to hold information relevant to the adaptation to agriculture, or indeed to any other area of economic activity.

Some other small refining adjustments were made to the approach taken for D3.3. The learning outcomes in D3.3 had been divided into two hard-edged options: “ability” or “knowledge”. While this does indeed correspond to a common approach to separate the components of a broad competence, it does not allow for alternative categories of learning outcome, even within agriculture. Here for D3.5 this issue is not dealt with in the ECS, but in the competency model. For the competency model, the classification of any particular definition is dealt with in the definition classification section.

Here, therefore, are given first the refined and optimized adapted AP, which reverts closer to the original form of D1.2, and then the new section of competence model AP.

In the tables that follow, unnecessary comments from the tables in D1.2 and D3.3 have been omitted.

## Key to the table columns

### element number

An identifying number for reference. Numbers in the ECS profile correspond to the numbering in the ECS itself. The number structure reflects the hierarchy of the information structure: e.g. the element 3.3.1 is part of the element 3.3.

### N: multiplicity

This uses the normal conventions as used in UML and elsewhere for how many of a particular element are allowed within the parent element. "1" means that there must be exactly one occurrence of this within the containing element. E.g. 3.3.1 must occur exactly once within every 3.3 structure (of which there can be any positive number). "0..1" means that it may or may not occur, but not more than once. "\*" means optionally any number of times. "1..\*" means it must occur at least once.

### element content

This gives an explanation of what the element is.

### data format

#### container

no data is associated with this element, as it just contains the lower-level elements.

#### string

plain unstructured text string of indefinite length

#### XHTML

formatted text, only XHTML and not other HTML, to preserve the integrity of an overall XML document

#### URL

link to existing web site for further information

#### URI

identifier that would normally resolve to a web page with useful information about the thing identified

#### CDATA string

This construct allows anything – even arbitrary XML – to be included within an XML document without disrupting the containing XML itself. See the [XML spec](#). Essentially, this means not committing at this stage to a decision on how to represent addresses.

### source spec

This column has suggestions for existing specifications on which to base the definition and format of the element.



## Key to background colours

White	Part of the base information model
Green	Refinement and optimisation
Light grey	An informative comment, not part of the information model
Grey-green	A comment about the refinement and optimisation
Dark grey	A visual separator

## 2.1. The refined and optimized ECS Application Profile

### Information model table

element number	N	element content	data format	source spec
0.	1	<b>Information about the document as a whole</b>	(container)	-
0.1	1	document language	ISO 629-1 language code <sup>[1]</sup>	<a href="#">RFC 5646</a>
0.2	1	Identifier	URI	<a href="#">dcterms:identifier</a> [2]
0.3	0..1	original identifier	URI	<a href="#">dcterms:identifier</a> [2]
0.4	*	Contributor	string, URI	<a href="#">dcterms:contributor</a> [2]
0.5	0..1	Creator	string, URI	<a href="#">dcterms:creator</a> [2]
0.6	0..1	Created	<a href="#">ISO date</a>	<a href="#">dcterms:created</a> [2] <a href="#">rfc 3339</a>
0.7	0..1	last modified	<a href="#">ISO date</a>	<a href="#">dcterms:modified</a> [2]



				<a href="#">rfc 3339</a>
0.8	1	Sector classification	string from vocab	<a href="#">NACE codes</a>
<p>This element is necessary for any sector-specific adaptation of the ECS Application Profile. It can be used by tools to adapt their behaviour in a sector-specific way even if the tool is used by several sectors simultaneously.</p> <p>The standard explanatory note is renumbered from 0.8 (as in D1.2) to 0.9.</p>				
0.9	1	standard explanatory note	XHTML	[5]
1.	1	<b>Title of the certificate</b>	(container)	-
1.1	1	title text	string	<a href="#">dcterms:title</a> [2]
1.2	0..1	title language	ISO language code[1]	<a href="#">ISO 639-1</a>
2.	0..1	<b>Translated title of the certificate</b>	string	<a href="#">dcterms:title</a> [2]
3.	1	<b>Profile of skills and competences</b>	(container)	-
3.1	0..1	learning outcome URI for section 3 as a whole	URI	-
3.2	0..1	complete text for section 3	XHTML	[5]
<p>There may be a close correspondence between the skills or competences given by the certificate as a whole and one particular external definition. If there is a URI for this, it should be put here in 3.1.</p> <p>If the URI of a separate definition corresponding to the certificate as a whole is given in 3.1, then if text is given in 3.2 above it should</p>				



correspond to text in the separate definition. However, there should be no text in 3.2 if the profile of skills and competences is structured, as normal, into separate learning outcomes, as in 3.3 below. Another way of putting this is that even where Section 3 is properly structured, there may be a URI for the certificate as a whole, but no text in 3.2. In any case, the text for the competence corresponding to the whole certificate will be given by the separate definition identified by the URI in element 3.1.

In no cases should there be content in element 3.2 together with items in element 3.3. They are alternatives, strictly exclusive.

The element for "single learning outcome" is renumbered from 3.2 (as it is in D 2.1) to 3.3

3.3		*	single learning outcome (or broader competence)	(container)	-
	3.3.1	1	description of learning outcome as "ECS-friendly" text	string	-
	3.3.2	0..1	learning outcome URI	URI	-

The component part URI leads to a full(er) expansion of the learning outcome, where further structure is given. Compared with D3.3, this version for D3.5 of the application profile reverts to the original form given in D1.2, because the detail is better placed in a separate structure, where it can be reused for different purposes. The separate structure is given in a separate table.

4.		0..1	<b>Range of occupations accessible to the holder</b>	(container)	-
	4.1	0..1	unstructured text for this	XHTML	[5]
AND/OR a structured list of accessible occupations (it is possible to envisage situations where both may be appropriate)					
	4.2	*	single accessible occupation	(container)	-
		1	accessible occupation name	string	-
		*	single accessible occupation identifier	(container)	-
		1	occupation classification system/scheme	string	-
		1	occupation classification code/term	string	-



	4.2.4	0..1	legal considerations	XHTML	[5]
5.			Official basis of the Certificate	<i>ignored</i>	-
5.1		1	<b>Awarding body</b>	(container)	-
	5.1.1	1	name of awarding body	string	-
	5.1.2	0..1	address of awarding body	CDATA string	<a href="#">see XML spec</a>
	5.1.3	0..1	phone of awarding body	string	-
	5.1.4	0..1	e-mail of awarding body	e-mail string	<a href="#">RFC 5322</a>
	5.1.5	0..1	website of awarding body	URL	-
	5.1.6	0..1	status of awarding body	string	-
5.2		0..1	<b>National / regional authority</b>	(container)	-
	5.2.1	1	name of authority	string	-
	5.2.2	0..1	address of authority	CDATA string	<a href="#">see XML spec</a>
	5.2.3	0..1	phone of authority	string	-
	5.2.4	0..1	e-mail of authority	e-mail string	<a href="#">RFC 5322</a>
	5.2.5	0..1	website of authority	URL	-
	5.2.6	0..1	status of authority	string	-



5.3		0..1	<b>Level of the certificate</b>	(container)	-	
	5.3.1	*	single framework and level	(container)	-	
		5.3.1.1	1	framework name	string	<a href="#">credit:scheme[3]</a>
		5.3.1.2	0..1	framework URI (if available)	URI	<a href="#">credit:scheme[3]</a>
		5.3.1.3	1	level in framework	string from vocab (for EQF: "1" to "8")	<a href="#">credit:level[3]</a>
	5.3.2	0..1	other unstructured level information	XHTML	[5]	
5.4		0..1	<b>Grading scale / Pass requirement</b>	(container)	-	
	5.4.1	0..1	unstructured grading scale information	XHTML	[5]	
	5.4.2	*	structured grading information	(container)	-	
		5.4.2.1	1	grade, as on an actual Certificate for which this is the supplement ( <i>default: Pass</i> )	string	-
		5.4.2.2	0..1	explanation of requirements for that grade	XHTML	[5]
5.5		0..1	<b>Access to next level</b>	XHTML	[5]	
5.6		0..1	<b>International agreements</b>	(container)	-	



5.6.1	0..1	unstructured text for this	XHTML	[5]
5.6.1 is sufficient for immediate use; however 5.6.2 is included as an optional alternative for future better practice. Both may be used.				
5.6.2	*	single related qualification	(container)	-
5.6.2.1	1	other qualification	URI	-
5.6.2.2	1	relation to other qualification	URI	<a href="#">SKOS mapping properties</a> [4]
5.7	0..1	<b>Legal basis</b>	XHTML	[5]
6.	1	<b>Officially recognised ways of acquiring the certificate</b>	XHTML	[5]
7.	0..1	<b>Entry/access requirements</b>	XHTML	[5]
8.	0..1	<b>Additional information</b>	XHTML	[5]
9.	1	<b>National reference point</b>	XHTML	[5]



## 2.2. The refined and optimized competence model

This has been developed from the model expressed in D1.4, but is now in the same format as the AP. The table columns and background colours are the same as for the previous table. Note: as this competence model is in effect refinement and optimization, no part is specially distinguished by colour.

element number	N	element content	data format	source spec
1.	1	<b>definition metadata</b>	(container)	-
1.1	1	identifier	URI	<a href="#">dcterms:identifier</a> [2]
The identifier should be the canonical URI that identifies the particular definition.				
1.2	1	default language	language code	<a href="#">dcterms:language</a> [2] <a href="#">xml:lang</a> ; <a href="#">RFC 5646</a> [1]
The default language is the language of the document as a whole. The content may also be expressed in any number of extra languages. In other bindings, this could be expressed as <code>dcterms:language</code> , but in an XML binding it would seem most appropriate to use <code>xml:lang</code> instead				
1.3	*	contributor	string, URI	<a href="#">dcterms:contributor</a> [2]
1.4	0..1	creator	string, URI	<a href="#">dcterms:creator</a> [2]
1.5	0..1	created	<a href="#">ISO date</a>	<a href="#">dcterms:created</a> [2] <a href="#">rfc 3339</a>
1.6	0..1	last modified	<a href="#">ISO date</a>	<a href="#">dcterms:modified</a> [2] <a href="#">rfc 3339</a>



2.		1	<b>definition content</b>	(container)	-
2.1		1..*	structured definition in one language	(container)	-
	2.1.1	0..1	language	language code	<a href="#">xml:lang</a> ; <a href="#">RFC 5646</a> ; [1]
If this element is absent, there may only be one structured definition, and it must be in the default language given in 1.2.					
	2.1.2	1	short description	container or string	-
		2.1.2.1	0..1	action verb(s)	string
This could be restricted to an agricultural vocabulary, if one were constructed. An unresolved issue is whether to have the short description able to contain plain text directly, or whether it would be better always to have the rest of short description, which would be the whole of the short description if there is no action verb.					
		2.1.2.2	0..1	rest of short description	string
	2.1.3	0..1	full description	formatted text	XHTML [5]
If more than one of these structured definitions is given, they must all be in different languages, and one of them must be in the default language given in 1.2. This is then taken as the default structured definition.					
2.2		0..1	context identifier	URI	-
This is an alternative to a full description, for cases where the definition is given in the context of a framework or other such structure, but quoted separate from, or outside that structure. One or other must be provided. This is important for short definitions of small granularity, where the complete content may only be a few words. For understanding the meaning of the definition, context needs to be supplied. To avoid ambiguity, only one such context is allowed.					



3.		0..1	<b>definition classification</b>	(container)	-
<p>Classifying a definition may serve several purposes, each with their own types of classification scheme.</p> <ol style="list-style-type: none"> <li>1. It can be categorised according to its formal type, which may govern the syntax of the short definition, determining for example whether there is an action verb or other components. For example, the formal types given in the EQF are: knowledge; skill; competence.</li> <li>2. It may be categorised according to its economic sector. This will in turn govern which other classification schemes are relevant.</li> <li>3. It may be related to any number of relevant classification schemes, for example, subjects, products, occupations.</li> </ol> <p>Because all these classification schemes have similar requirements for structure, they are here given within the same model structure, which is borrowed from Atom [6].</p>					
3.1		*	category	(container)	<a href="#">atom:category</a>
	3.1.1	1	term	string or URI	<a href="#">atom:term</a>
	3.1.2	0..1	scheme	string or URI	<a href="#">atom:scheme</a>
	3.1.3	0..1	label	string	<a href="#">atom:label</a>
<p><b>Formal type</b></p> <p>Agricultural learning outcomes fall into the normal pattern of abilities (skills or competences, or sometimes known as "performance criteria") and knowledge. It is seen as useful to make this distinction here, as this will determine whether the item has an action verb or not. Another common formal type classification follows the EQF: knowledge; skill; competence. The issue here is that skill and competence do not have different forms, and they may be difficult to distinguish objectively.</p> <p><b>Economic sector</b></p> <p>For European use, the proposed scheme is the Statistical Classification of Economic Activities in the European Community, Rev. 2 (2008), commonly referred to as "NACE". The <a href="#">NACE Rev. 2</a> classification scheme should be used the economic sector specifically relevant to the</p>					



particular learning outcome. As NACE has no defined URI, element 3.1.1 should contain the string "NACE2"; element 3.1.2 should conform to the format given in the standard reference – i.e. EITHER a single capital letter OR two digits, optionally followed by a '.' character and more digits. Agriculture covers "A" by itself, and any numeric code starting with "01", "02", or "03". A letter MUST NOT be followed by numbers, as this is not a standard representation. Element 3.1.3 may contain any relevant string, preferably in the default language given in 1.2.

### Agricultural classification schemes

The [AGROVOC](#) vocabularies may be used to indicate topics connected with a particular learning outcome or competence. If using AGROVOC, element 3.1.1 should contain the string "AGROVOC"; element 3.1.2 should contain the numeric AGROVOC code; and element 3.1.3 should contain any appropriate AGROVOC label, preferably in the default language given in 1.2.

Any other classification scheme may also be used, but for an effective adaptation to agriculture, particular allowed classification schemes should be listed. AGROVOC would be an obvious choice for topics related to a particular competence concept. It may also be agreed, for example, only to use the simple distinction between ability and knowledge for the formal type. These would be a matter of agreement between the stakeholders involved.

4		0..1	<b>relations with other definitions</b>	(container)	-
	4.1	*	single relation	(container)	-
		4.1.1	1	relationship	URI vocabulary
		4.1.2	1	other definition URI	URI -

The vocabulary for relationships is based on SKOS with a little refinement. See more detailed discussion in the eCOTOOL Competence Model (D1.4), Section 5: "The eCOTOOL Competence Model (Technical)".

The basic relationships for hierarchical structures are skos:broader and skos:narrower, but for greater applicability these need to be supplemented with the information about whether they refer to necessary or optional parts. Therefore four extra sub-properties are introduced here. Optionality is more essential for defining qualification and curriculum structures than pure competence structures, but optionality may also be useful even there, if there is more than one way of achieving a desired outcome.



- skos:narrower
  - eloc:hasNecessaryPart
  - eloc:hasOptionalPart
  - skos:narrowMatch
- skos:broader
  - eloc:isNecessaryPartOf
  - eloc:isOptionalPartOf
  - skos:broadMatch
- skos:closeMatch
  - skos:exactMatch
- skos:relatedMatch

for skos: the URI base is <http://www.w3.org/2004/02/skos/core#>

for eloc: the URI base remains to be determined

These are the proposed meanings of the [SKOS mapping properties](#) [4]:

- skos:exactMatch → this definition is recognised as equivalent to the other one
- skos:broadMatch → this definition covers a subset of the other one
- skos:narrowMatch → this definition covers a superset of the other one
- skos:closeMatch → this definition overlaps with and is similar to the other one
- skos:relatedMatch → this definition is related to the other one in a looser or different way

Within a sector, it is often useful to know how one particular definition of skill or competence relates to other commonly used definitions. The relationships here allow that, as well as enabling the clearly necessary hierarchical relationships within a single framework.

5.		0..1	<b>level attribution</b>	(container)	-
----	--	------	--------------------------	-------------	---



Level attribution is not the same as level definition. It relies on a pre-defined level scheme or framework, and the level scheme cannot be defined within a single competence definition. The attribution associates the competence concept with a level in a scheme. Some sectors have sector-wide level schemes, and specifying which level schemes to use gives a good way of adapting this to a particular area of economic activity.

5.1	*	level	(container)	-
5.1.1	1	scheme identifier	string or URI	-

The scheme is the overall framework that defines the levels. A commonly used scheme in Europe is the EQF. Nations have their own national frameworks. International level frameworks also exist. At present, few if any schemes have URIs, but they are needed for unambiguous identification. Note that the EQF itself comprises three distinct schemes, for knowledge, for skills, and for competence, and each one needs to be identified differently.

5.1.2	0..1	level identifier	string or URI	-
-------	------	------------------	---------------	---

At least one of level identifier and level number is required. Where the levels are identified solely by numbers in the right sense, the level identifier and level numbers may be the same. The level identifier may also be used as a text label, where there is an effective level number.

5.1.3	0..1	level number	number	-
-------	------	--------------	--------	---

This may be used in addition to a level identifier in cases where the level identifier is not itself a number, or where the level identifiers are numbers in the wrong sense. It may also optionally duplicate a number present in the level identifier. If it is used, a higher level must be represented by a larger number. The number assigned need not necessarily be one explicitly defined in the level scheme. It could alternatively be a number between those defined. A level number may only be used without a level identifier in cases where the level scheme is unambiguously numeric in the correct sense.



## Notes to the tables

[1] ISO 639-1 language codes

Viewable at [Wikipedia](#) or the [Library of Congress](#)

The ISO codes are suggested for the Dublin Core dcterms:language, and referenced both by the XML documentation and by RFC 5646.

[2] Dublin Core

See the [DCMI Metadata Terms](#)

[3] Educational Credit Information Model

CWA 16077, available as a whole from <ftp://ftp.cen.eu/CEN/Sectors/TCandWorkshops/Workshops/CWA16077.pdf>

[4] Simple Knowledge Organization System

See <http://www.w3.org/2004/02/skos/>

[5] [XHTML](#)

An effective interoperability specification might need to specify a subset or profile of XHTML, to allow links and formatting, but probably not embedded content.

[6] The Atom Syndication Format, section 4.2.2

See <http://tools.ietf.org/html/rfc4287>

## 3. Refinement and optimisation of XML bindings

### 3.1. Europass Certificate Supplement

This example XML is based on the one given in deliverables D2.1, D2.3 and D3.3. A few comments are included to provide a little guidance. The refinement and optimisation here correspond to the refinement and optimisation given in the application profile. The example XML is simply one possible approach to binding that refined and optimised application profile to XML. The XSD is just one possible version that works with the example XML.

#### Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<europassCS xmlns="http://www.competencetools.eu/ecotool"
  xmlns:dcterms="http://purl.org/dc/terms/"
  xml:lang="en"> <!-- this is the place for the language of the document as a whole, which might otherwise appear as dcterms:language -->
<documentMetadata>
  <dcterms:identifier>http://www.competencetools.eu/ecotool/repository/CS/101/en/CS_101_en</dcterms:identifier>
  <originalIdentifier>http://www.competencetools.eu/ecotool/repository/CS/101/en/CS_101_de</originalIdentifier>
  <dcterms:creator>c.gauss</dcterms:creator>
  <dcterms:created>2011-08-08T11:41:31.000+02:00</dcterms:created>
  <dcterms:contributor>einstein</dcterms:contributor>
  <dcterms:contributor>bacchus</dcterms:contributor><!-- added to show multiple contributors -->
  <dcterms:modified>2011-11-04T11:36:57.000+01:00</dcterms:modified>
  <sectorClassification>01.21</sectorClassification>
</documentMetadata>
<originalTitle xml:lang="de">Winzer/Winzerin</originalTitle>
<translatedTitle>Wine grower (m/f)</translatedTitle>
<abilityProfile>
  <abilityURI>http://www.example.com/abilities/1</abilityURI> <!-- this is an imagined URI for the overall ability for the ECS -->
  <freeText></freeText> <!-- only used if separate abilities are not defined -->
  <ability>
    <abilityName>Execute work activities in an autonomous manner according due consideration to the principles of nature and environmental
conservation, safety, health and safety at work and workplace ergonomics</abilityName>
  </ability>
  <ability>
    <abilityName>Comply with national and EU statutory regulations</abilityName>
  </ability>
  <ability>
    <abilityName>Advise customers</abilityName>
  </ability>
  <ability>
    <abilityName>Market wine and other products</abilityName>
  </ability>
</abilityProfile>
```



```

<ability>
  <abilityName>Assess and present wine</abilityName>
</ability>
<ability>
  <abilityName>Fill, label and pack wine</abilityName>
  <abilityURI>http://www.example.com/abilities/123</abilityURI>
</ability>
<ability>
  <abilityName>Make wine using oenological processes</abilityName>
</ability>
<ability>
  <abilityName>Plant, tend and use vines with in a quality oriented manner and in accordance with environmental
considerations</abilityName>
</ability>
<ability>
  <abilityName>Work and tend the soil to maintain sustainable fertility</abilityName>
</ability>
<ability>
  <abilityName>Procure and evaluate information</abilityName>
</ability>
<ability>
  <abilityName>Handle and maintain machinery, plants and company equipment and be aware of and assess processes</abilityName>
</ability>
<ability>
  <abilityName>Make other products from grapes and wine</abilityName>
  <abilityURI></abilityURI>
</ability>
<ability>
  <abilityName>Make other products from grapes and wine</abilityName>
  <abilityURI></abilityURI>
</ability>
<ability>
  <abilityName>Make wine</abilityName>
  <abilityURI>http://www.sampleframework.com/abilities/321</abilityURI>
</ability>
<ability>
  <abilityName>Cultivate and tend vines for the purpose of growing grapes</abilityName>
  <abilityURI></abilityURI>
</ability>
</abilityProfile>
<occupationRange>
  <freeText></freeText>
<occupation>
  <occupationName>Wine growers work in wine growing companies or vineyards and in companies involved in upstream and downstream
divisions of the winemaking industry.</occupationName>
  <occupationIdentifier>
    <occupationScheme>UK SOC 2010</occupationScheme>
    <occupationCode>5112</occupationCode>
  </occupationIdentifier>
  <note>Ownership of this certificate legally allows the owner to perform this occupation in the original nation</note>

```



```

    </occupation>
    <occupation></occupation> <!-- any number of occupations are possible -->
</occupationRange>
<awardingBody>
    <name>responsible body for vocational training in the agriculture</name>
    <address></address>
    <phone></phone>
    <website></website>
    <email></email>
    <status>public</status>
</awardingBody>
<nationalRegionalAuthority>
    <name>responsible body for vocational training in the agriculture</name>
    <address></address>
    <phone></phone>
    <website></website>
    <email></email>
    <status>public</status>
</nationalRegionalAuthority>
<certificateLevel>
    <framework>
        <fwName>ISCED</fwName>
        <fwURI>http://www.uis.unesco.org/Education/Pages/international-standard-classification-of-education.aspx</fwURI>
<!-- currently this is an ordinary URL, should really be a proper URI -->
        <fwLevel>3</fwLevel>
    </framework>
    <freeText></freeText>
</certificateLevel>
<gradingScale>
    <freeText>Note that higher grades in this case have lower numbers. The complete scale is graded from 1 (excellent) to 6 (fail). For results
that are graded 5 (poor) and 6 a certificate is not issued, so those grades are not included here in the grading scale.</freeText>
    <grade>
        <label>4</label>
        <explanation>pass: scored 66 - 50 points</explanation>
    </grade>
    <grade>
        <label>3</label>
        <explanation>average: scored 80 - 67 points</explanation>
    </grade>
    <grade>
        <label>2</label>
        <explanation>good: scored 91 - 81 points</explanation>
    </grade>
    <grade>
        <label>1</label>
        <explanation>excellent: scored 100-92 points</explanation>
    </grade>
</gradingScale>
<accessNextLevel>Entry requirements are not governed by legislation; as a rule, young people are admitted after completing (nine or ten years of)
general education.</accessNextLevel>

```



```

<internationalAgreements>
  <freeText>In the field of vocational training, joint declarations on the comparability of qualifications obtained in the respective
vocational training systems have been signed on the basis of bilateral agreements concluded between Germany and France and between Germany and
Austria.</freeText>
  <relatedQualification>
    <qualificationURI>http://www.example.fr/viticulteur</qualificationURI>
    <qualificationRelation>skos:exactMatch</qualificationRelation>
  </relatedQualification>
</internationalAgreements>
<legalBasis>Ordinance on Initial Vocational Education and Training in the Occupation of Wine grower (m/f) of 02/03/1997 (Federal Law Gazette, Part
I, p 161) Resolution of the Standing Conference of the Ministers of Education and Cultural Affairs of the Laender in the Federal Republic of
Germany, KMK, of 21.11.1996), (Federal Gazette, No 189a of 10.10.1997)</legalBasis>
<acquisitionWays><div xmlns="http://www.w3.org/1999/xhtml">Final examination administered by the competent body:
  <ol>
    <li>after completion of dual training in a company and at part-time vocational school (normal procedure)</li>
    <li>after retraining in a recognized training occupation</li>
    <li>as an external examination for working people without formal vocational qualifications or persons who have been trained at full-
time vocational schools or other vocational training institutions</li>
  </ol>
</div></acquisitionWays>
<!-- similar to atom:content type="xhtml"; note that several other fields may also have xhtml in place of plain text in the same way as
acquisitionWays -->
<accessRequirements>Entry requirements are not governed by legislation; as a rule, young people are admitted after completing (nine or ten years of)
general education.</accessRequirements>
<additionalInformation>Duration of training: 3 years. Training in the "dual system": Teaching of the knowledge, skills and competences needed for an
occupation is based on the typical requirements of work and business processes and prepares the trainees for a specific job. The training is
provided in a company and at part time vocational school: In the company, the trainees acquire practical skills in a real working environment. On
one or two days per week, the trainees attend part-time vocational school, where they are taught general and vocational knowledge related to their
training occupation.</additionalInformation>
<nationalReferencePoint>More information is available at:
www.berufenet.arbeitsagentur.de
National Europass Centre
www.europass-info.de</nationalReferencePoint>
</europassCS>

```

## Refined and optimised XSD for Europass Certificate Supplement

```

<?xml version="1.0" encoding="UTF-8"?>
<!-- this XSD intended to correspond to the application profile in eCOTOOL D3.5 -->
<!-- hand edited by Simon Grant starting from KION's XSD for eCOTOOL D2.3 -->
<xs:schema xmlns="http://www.competencetools.eu/ecotool"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:dcmitype="http://purl.org/dc/dcmitype/"
  xmlns:dcterms="http://purl.org/dc/terms/"
  targetNamespace="http://www.competencetools.eu/ecotool"
  elementFormDefault="qualified"
  version="1.0">
  <xs:import namespace="http://purl.org/dc/terms/" schemaLocation="http://dublincore.org/schemas/xmls/qdc/dcterms.xsd"/>
  <xs:import namespace="http://purl.org/dc/dcmitype/" schemaLocation="http://dublincore.org/schemas/xmls/qdc/dcmitype.xsd"/>

```



```

<xs:import namespace="http://www.w3.org/XML/1998/namespace" schemaLocation="http://www.w3.org/2001/03/xml.xsd"/>
<xs:element name="europassCS">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="documentMetadata" type="documentMetadataType">
        <xs:annotation>
          <xs:documentation>Information about the document as a whole</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="originalTitle">
        <xs:complexType>
          <xs:simpleContent>
            <xs:extension base="xs:string">
              <xs:attribute ref="xml:lang"/>
            </xs:extension>
          </xs:simpleContent>
        </xs:complexType>
      </xs:element>
      <xs:element name="translatedTitle" type="xs:string" minOccurs="0"/>
      <xs:element name="abilityProfile" type="abilityProfileType">
        <xs:annotation>
          <xs:documentation>profile of skills and competences (ref. #3)</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="occupationRange" type="occupationRangeType" minOccurs="0">
        <xs:annotation>
          <xs:documentation>Range of accessible occupations (ref. #4)</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="awardingBody" type="EntityReference">
        <xs:annotation>
          <xs:documentation>Awarding body (ref. #5.1)</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="nationalRegionalAuthority" type="EntityReference" minOccurs="0">
        <xs:annotation>
          <xs:documentation>National / regional authority (ref. #5.2)</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="certificateLevel" type="certificateLevelType" minOccurs="0">
        <xs:annotation>
          <xs:documentation>Level of the certificate (ref. #5.3)</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="gradingScale" type="gradingScaleType" minOccurs="0">
        <xs:annotation>
          <xs:documentation>Grading scale / Pass requirement (ref. #5.4)</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="accessNextLevel" type="xhtmlType" minOccurs="0">

```



```

        <xs:annotation>
          <xs:documentation>Access to next level (ref. #5.5)</xs:documentation>
        </xs:annotation>
      </xs:element>
    <xs:element name="internationalAgreements" type="internationalAgreementsType" minOccurs="0">
      <xs:annotation>
        <xs:documentation>International agreements (ref. #5.6)</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="legalBasis" type="xhtmlType" minOccurs="0">
      <xs:annotation>
        <xs:documentation>Legal basis (ref. #5.7)</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="acquisitionWays" type="xhtmlType">
      <xs:annotation>
        <xs:documentation>Officially recognised ways of acquiring certificate (ref. #6)</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="accessRequirements" type="xhtmlType" minOccurs="0">
      <xs:annotation>
        <xs:documentation>Entry/access requirements (ref. #7)</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="additionalInformation" type="xhtmlType" minOccurs="0">
      <xs:annotation>
        <xs:documentation>Additional information (ref. #8)</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="nationalReferencePoint" type="xhtmlType">
      <xs:annotation>
        <xs:documentation>National reference point (ref. #9)</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
  <xs:attribute ref="xml:lang" use="optional"/>
</xs:complexType>
</xs:element>
<xs:complexType name="documentMetadataType">
  <xs:sequence>
    <xs:element ref="dcterms:identifier"/>
    <xs:element name="originalIdentifier" minOccurs="0"/>
    <xs:element ref="dcterms:contributor" minOccurs="0"/>
    <xs:element ref="dcterms:creator" minOccurs="0"/>
    <xs:element ref="dcterms:created" minOccurs="0"/>
    <xs:element ref="dcterms:contributor" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element ref="dcterms:modified" minOccurs="0"/>
    <xs:element name="sectorClassification" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>

```



```

<xs:complexType name="EntityReference">
  <xs:all>
    <xs:element name="name" type="xs:string"/>
    <xs:element name="address" type="CDATAString" minOccurs="0"/>
    <xs:element name="phone" type="xs:string" minOccurs="0"/>
    <xs:element name="email" type="xs:string" minOccurs="0"/>
    <xs:element name="website" type="xs:string" minOccurs="0"/>
    <xs:element name="status" type="xs:string" minOccurs="0"/>
  </xs:all>
</xs:complexType>
<xs:complexType name="abilityType">
  <xs:sequence minOccurs="0" maxOccurs="unbounded">
    <xs:element name="abilityName" type="xs:string"/>
    <xs:element name="abilityURI" type="uriType" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="abilityProfileType">
  <xs:sequence>
    <xs:element name="abilityURI" type="uriType" minOccurs="0"/>
    <xs:element name="freeText" type="xhtmlType" minOccurs="0"/>
    <xs:element name="ability" type="abilityType" minOccurs="1" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="occupationRangeType">
  <xs:sequence>
    <xs:element name="freeText" type="xhtmlType" minOccurs="0"/>
    <xs:element name="occupation" minOccurs="0" maxOccurs="unbounded">
      <xs:annotation>
        <xs:documentation>accessible occupation (ref. #4.2)</xs:documentation>
      </xs:annotation>
      <xs:complexType>
        <xs:sequence minOccurs="0" maxOccurs="unbounded">
          <xs:element name="occupationName" type="xs:string"/>
          <xs:element name="occupationIdentifier" minOccurs="0">
            <xs:complexType>
              <xs:sequence maxOccurs="unbounded">
                <xs:element name="occupationScheme"/>
                <xs:element name="occupationCode"/>
              </xs:sequence>
            </xs:complexType>
          </xs:element>
          <xs:element name="note" type="xs:string" minOccurs="0"/>
        </xs:sequence>
      </xs:complexType>
    </xs:element>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="certificateLevelType">
  <xs:sequence>
    <xs:element name="framework" minOccurs="0" maxOccurs="unbounded">

```



```

        <xs:annotation>
          <xs:documentation>frameworks and levels (ref. #5.3.1)</xs:documentation>
        </xs:annotation>
      <xs:complexType>
        <xs:sequence>
          <xs:element name="fwName" type="xs:string"/>
          <xs:element name="fwURI" type="uriType"/>
          <xs:element name="fwLevel" type="xs:string"/>
        </xs:sequence>
      </xs:complexType>
    </xs:element>
    <xs:element name="freeText" type="xhtmlType" minOccurs="0" maxOccurs="1">
      <xs:annotation>
        <xs:documentation>other unstructured level information (ref. #5.3.2)</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="gradingScaleType">
  <xs:sequence>
    <xs:element name="freeText" type="xhtmlType" minOccurs="0" maxOccurs="1">
      <xs:annotation>
        <xs:documentation>other unstructured grade information (ref. #5.4.1)</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="grade" minOccurs="0" maxOccurs="unbounded">
      <xs:annotation>
        <xs:documentation>grades and their explanations (ref. #5.4.2)</xs:documentation>
      </xs:annotation>
      <xs:complexType>
        <xs:sequence>
          <xs:element name="label" type="xs:string"/>
          <xs:element name="explanation" type="xs:string"/>
        </xs:sequence>
      </xs:complexType>
    </xs:element>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="internationalAgreementsType">
  <xs:sequence>
    <xs:element name="freeText" type="xhtmlType" minOccurs="0" maxOccurs="1">
      <xs:annotation>
        <xs:documentation>unstructured international agreements information (ref. #5.6.1)</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="relatedQualification" minOccurs="0" maxOccurs="unbounded">
      <xs:annotation>
        <xs:documentation>related qualifications (ref. #5.6.2)</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
</xs:complexType>

```



```

        <xs:sequence>
          <xs:element name="qualificationURI" type="xs:string"/>
          <xs:element name="qualificationRelation" type="xs:string"/>
        </xs:sequence>
      </xs:complexType>
    </xs:element>
  </xs:sequence>
</xs:complexType>
<xs:simpleType name="CDATAString">
  <xs:annotation>
    <xs:documentation>original had something with JAXB - now removed</xs:documentation>
  </xs:annotation>
  <xs:restriction base="xs:string"/>
</xs:simpleType>
<xs:simpleType name="uriType">
  <xs:restriction base="xs:string"/>
</xs:simpleType>
<xs:complexType name="htmlType" mixed="true">
<!-- this is not what is really wanted - it should allow a single real XHTML div, complete with contents, but nothing else -->
  <xs:sequence>
    <xs:any namespace="##any" processContents="skip" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>
</xs:schema>

```

### 3.2. An individual competence definition

This example represents one possible way in which a single competence definition could be represented, so that the ECS can refer to it as illustrated in the example XML for the ECS, above. It corresponds to the application profile for the eCOTOOL Competence Model, given above. Here also a few comments are given, to clarify some of the issues. As with the ECS, the XSD

Please refer also to deliverable D1.4 for further explanation.

#### Example XML

```

<?xml version="1.0" encoding="UTF-8"?>
<competence xmlns="http://www.competencetools.eu/ecotool/competence"
  xmlns:dcterms="http://purl.org/dc/terms/"
  xmlns:atom="http://www.w3.org/2005/Atom"
  xml:lang="en">
  <dcterms:identifier>http://www.example.com/abilities/winemaking/123</dcterms:identifier>
  <dcterms:contributor>Simon Grant</dcterms:contributor>
  <dcterms:contributor>Chiara Carlino</dcterms:contributor>
  <dcterms:creator>Frederick Taylor</dcterms:creator>
  <dcterms:created>2012-01-20T17:00:00.000+00:00</dcterms:created>
  <definition xml:lang="en">

```



```

<shortDescription>
  <actionVerb>Fill, label and pack</actionVerb>
  <complement>wine</complement>
</shortDescription>
<fullDescription><div xmlns="http://www.w3.org/1999/xhtml">
<p>Filling, labelling and packing wine may involve operating relevant specialist machinery.</p>
<ul>
<li>For large wine producers, the process will be largely automated, and the competence will involve extensive knowledge of the operation of the automatic machinery.</li>
<li>For small wine producers, each process may be separate and done manually, either by one person or by a team working together.</li>
</ul>
<p>In all cases, a person with this overall competence will take responsibility for ensuring that the wine is correctly labelled, and the labels on the wine corresponds to the label on the packs; and for ensuring that the whole process complies with relevant health and safety and trading standards regulations.</p>
</div></fullDescription>
</definition>
<definition xml:lang="it">
  <shortDescription>
    <actionVerb>Riempire, etichettare e impacchettare</actionVerb>
    <complement>il vino</complement>
  </shortDescription>
  <fullDescription>Riempire, etichettare e impacchettare il vino può richiedere l'uso di macchinari specialistici. Per produttori di vino su larga scala, il processo sarà in gran parte automatizzato e la competenza includerà un'ampia conoscenza dell'operatività dei macchinari. Per piccoli produttori, ogni processo potrebbe essere separato e compiuto manualmente, da una persona o da una squadra. In ogni caso, una persona con questa competenza complessiva avrà la responsabilità di assicurarsi che il vino sia correttamente etichettato e che le etichette sul vino corrispondano a quelle sui pacchi; sarà inoltre responsabile di assicurarsi che l'intero processo si svolga in osservazione dei regolamenti standard di sicurezza salute e commercio.</fullDescription>
</definition>
<contextIdentifier>http://www.example.com/abilities/winemaking</contextIdentifier>
<!-- the following classification information is represented semantically equivalent to Atom, but with different syntax.
As Atom has no XSD, Atom attributes are redefined as elements here.
Other XML bindings are possible -->
<category>
  <term>11.02</term>
  <scheme>NACE</scheme>
  <label>Manufacture of wine from grape</label>
</category>
<category>
  <term>http://aims.fao.org/aos/agrovoc/c_8405</term>
  <scheme>http://aims.fao.org/aos/agrovoc/c_7644</scheme>
  <label>Winemaking</label>
</category>
<category>
  <term>http://aims.fao.org/aos/agrovoc/c_25770</term>
  <scheme>http://aims.fao.org/aos/agrovoc/c_330919</scheme>
  <label>Winemaking equipment</label>
</category>
<!-- ideally the scheme values should be IRIs, when canonical IRIs are available, and where more information about the scheme (including its common name) is available through the IRI. Clear agreements are needed between different parties exchanging information about whether a term is an extension to a IRI or a IRI in its own right. Both are potentially workable. Labels in different languages should be available through the IRI. -->

```



```

<relation>
  <relationship>eloc:isNecessaryPartOf</relationship>
  <otherIRI>http://www.example.com/abilities/winemaking/1</otherIRI>
</relation>
<relation>
  <relationship>skos:exactMatch</relationship>
  <otherIRI>http://www.example.fr/vinification/123</otherIRI>
</relation>
<attributedLevel>
  <levelScheme>ISCED</levelScheme>
  <levelID></levelID> <!-- in this case the label is the same as the number, so not needed, but this is not always the case -->
  <levelNumber>3</levelNumber>
</attributedLevel>
<!-- this example XML is intended to conform with the latest Application Profile of the eCOTOOL Competence Model -->
</competence>

```

## Refined and optimised XSD for a single competence definition

```

<?xml version="1.0" encoding="UTF-8"?>
<!-- this XSD intended to correspond semantically to the application profile in eCOTOOL D3.5 -->
<!-- hand edited by Simon Grant, 2012-01-26 -->
<xs:schema xmlns="http://www.competencetools.eu/ecotool/competence"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:dcmitype="http://purl.org/dc/dcmitype/"
  xmlns:dcterms="http://purl.org/dc/terms/"
  targetNamespace="http://www.competencetools.eu/ecotool/competence"
  elementFormDefault="qualified"
  version="1.0">
  <xs:import namespace="http://purl.org/dc/terms/" schemaLocation="http://dublincore.org/schemas/xmls/qdc/dcterms.xsd"/>
  <xs:import namespace="http://purl.org/dc/dcmitype/" schemaLocation="http://dublincore.org/schemas/xmls/qdc/dcmitype.xsd"/>
  <xs:import namespace="http://www.w3.org/XML/1998/namespace" schemaLocation="http://www.w3.org/2001/03/xml.xsd"/>
  <xs:element name="competence">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="dcterms:identifier"/>
        <xs:element ref="dcterms:contributor" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element ref="dcterms:creator" minOccurs="0"/>
        <xs:element ref="dcterms:created" minOccurs="0"/>
        <xs:element ref="dcterms:modified" minOccurs="0"/>
        <xs:element name="definition" type="definitionType" maxOccurs="unbounded"/>
        <!-- does not check that there is at most one definition in each different language -->
        <xs:element name="contextIdentifier" type="xs:string" minOccurs="0"/>
        <xs:element name="category" type="categoryType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="relation" type="relationType" minOccurs="0" maxOccurs="unbounded"/>
        <xs:element name="attributedLevel" type="attributedLevelType" minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:attribute ref="xml:lang" use="optional"/>
    </xs:complexType>
  </xs:element>

```



```

<xs:complexType name="definitionType">
  <xs:sequence>
    <xs:element name="shortDescription">
<!-- ideally, the short description should allow a plain text alternative, without child elements -->
      <xs:complexType mixed="true">
        <xs:sequence>
          <xs:element name="actionVerb" type="xs:string" minOccurs="0"/>
          <xs:element name="complement" type="xs:string" minOccurs="0"/>
        </xs:sequence>
      </xs:complexType>
    </xs:element>
    <xs:element name="fullDescription" type="xhtmlType" minOccurs="0"/>
  </xs:sequence>
  <xs:attribute ref="xml:lang" use="optional"/>
</xs:complexType>
<xs:complexType name="categoryType">
  <xs:sequence>
    <xs:element name="term" type="xs:string"/>
    <xs:element name="scheme" type="xs:string" minOccurs="0"/>
    <xs:element name="label" type="xs:string" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="relationType">
  <xs:sequence>
    <xs:element name="relationship" type="iriType"/>
    <xs:element name="otherIRI" type="iriType"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="attributedLevelType">
  <xs:sequence>
    <xs:element name="levelScheme" type="xs:string"/>
    <xs:element name="levelID" type="xs:string" minOccurs="0"/>
    <xs:element name="levelNumber" type="xs:string" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<xs:simpleType name="iriType">
  <xs:restriction base="xs:string"/>
<!-- though of course what is really wanted here is an effective restriction to reasonable IRIs -->
</xs:simpleType>
<xs:complexType name="xhtmlType" mixed="true">
<!-- this is not what is really wanted - it should allow a single real XHTML div, complete with contents, but nothing else -->
  <xs:sequence>
    <xs:any namespace="##any" processContents="skip" minOccurs="0" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>
</xs:schema>

```



## 4. Commentary and conclusion

The examples of XML and the XSDs demonstrate several important things. First, the competence definition XML is compact and intuitively understandable. The Dublin Core terms are readily recognizable to most users of metadata. Even though given with a different syntax, the Atom categories will also be familiar to many people. The other main sections should make sense in their own terms. The definition can have several languages, and this is vital for the optimization of the tools across Europe, as it means that the same definition can be matched across different language users. The relations and levels should also be readily understood. There are persuasive cases for including this information together with definitions of competence, so that the definitions are optimally useful in ICT tools.

However, this amount and kind of information is not expected in a Europass Certificate Supplement, and if placed there would distort the ECS grossly. It can only properly be put separately. The bonus is that this same information is then available for use for many other purposes, as long as it is able to be clearly and unambiguously identified, which is the function of the identifier, using the now very well-established principles of URIs for identification. The URI must then go in the ECS, and it makes sense for that URI to be placed alongside a short description that can be used for quick reference. That short description is none other than the original text used in the ECS originally.

Ideally, if all competence concepts were defined separately, with URIs to identify them, they could be used not only by the ECS, but also: by documents specifying the intended learning outcomes of courses and qualifications beyond the ECS; by individuals in their portfolios claiming skills and competence; by employers, when specifying profiles for job vacancies. When collected together and structured into an occupational standard or framework, the kind of information given in the example above provides a good basis.

One further advantage is that when competences are defined separately, they continue to exist regardless of changes to the structure and format of instruments such as the ECS. This means that work done on competence definitions in this way will be of enduring value, despite the likely upcoming changes in Europass and other documentation of vocational and other qualifications.

---

## **About the European project** **eCOTOOL:**



eCOTOOL focuses on:

- (1) the improvement of the development, exchange, and maintenance of vocational education and training (VET) certificates and their accessibility and transparency and
- (2) the increasing of the European mobility and transparency in general.

To achieve these objectives eCOTOOL develops the adaptable Europass CS eco-tools based on the European policies Europass Certificate Supplement (CS), EQF, ECVET, and PAS 1093. The Europass CS eco-tools will be tested and evaluated in the agricultural sector.

Finally the eCOTOOL results are submitted to the European Standardization Committees (CEN/TC 353) to achieve a European consensus and standard for VET competences.

More information about eCOTOOL online:

<http://www.competencetools.eu>

### **eCOTOOL Contact:**

Coordinator: Christian M. Stracke  
Organization: University of Duisburg-Essen  
Address: Universitaetsstr. 9 (ICB)  
45141 Essen, GERMANY  
Telephone: +49 (0)201-183-4410  
E-Mail: christian.stracke@icb.uni-due.de



This project has been funded with support from the European Commission. This communication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.