



TRansparent Competences in Europe

ePortfolios, Ontologies and TRACE

a discussion paper

University of Reading and SkillsNET

1. Introduction

The initial work of work package 3 under the TRACE Leonardo project has been looking at the feasibility of creating links between competency frameworks and individuals into an intermediate generalised representation of competencies to enable transparency.

The representation that was used to perform these feasibility test where the "knowledge, skills, abilities and others" approach used in the O*NET Content Model Framework (<http://online.onetcenter.org/>).

The representation that has been used for individuals were ePortfolios. An ePortfolio is defined by EDUCAUSE NLII as "a collection of authentic and diverse evidence, drawn from a larger archive, that represents what a person or organisation has learned over time, on which the person or organisation has reflected, designed for presentation to one or more audiences for a particular rhetorical purpose." (Cited by IMS at http://www.imsglobal.org/ep/epv1p0/imsep_infov1p0.html)

This feasibility process showed up several problems especially related to the granularity needed of the representation to provide transparency on the individual personal level. Another issue was how to get from a representation in free text such as an ePortfolio to a standardised representation.

This paper is meant as a discussion paper looking at the problems at hand introducing possible approaches to solving them, and hopefully will show the reader the complexity of the task at hand, but also that it could be feasible to create a transparent competency system. The authors are fully aware that there might be other suitable approaches and the intention of the paper is indeed to help identify such approaches.

2. Granularity

There is a distinct relationship between Competency gradation and utility. Performance Competencies require the descriptor and performance measures to be more cross-cutting (generalised) throughout numerous professional careers, whereas Enabling Competencies for the person and/or job requirements are more discrete. Both have applicability to personal inventories, though the more discrete Competencies having greater impact on personal career growth.

When talking about the granularity of the competence representations, what is really being discussed are the nature and "semantic size" (meaning) of the "building blocks" (the competencies.) These building blocks can be used as parts in the Reusable Competency Descriptions (RCD) and combined into Simple Reusable Competency Mappings (SRCM) to create the competency representations (Lundqvist 2006).

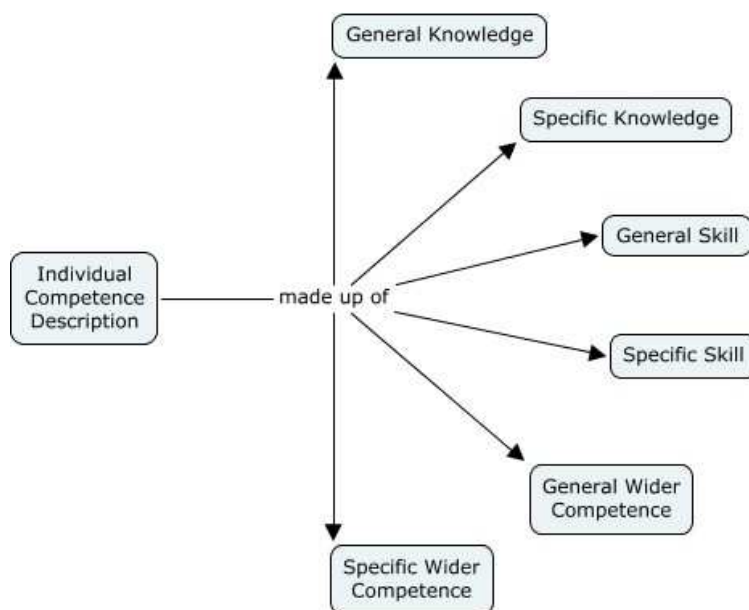
The first step in this discussion arose from the realisation that there is a difference between generalised and specific competence “building blocks”. When analysing the O*NET Content Model KSAO documents, it was noted that all attributes were of a general nature, with the strength of being able to measure a wealth of information under common umbrellas. For instance, the knowledge umbrella of “Computer and Electronics” encompasses knowledge of electric circuit boards, processors, chips, and computer hardware and software including applications and programming. In this context, knowledge of how to operate a VCR is measured on the same scale as creating a program to scan a computer disk for viruses.

This feature is a strong point in the sense that it enables HR personnel to organise work into logical job structures and representative task (behaviours) in a generalised approach. However, this feature may become a problem where there is a need to describe performance competences in an individualised sphere (e.g., when describing individuals or specific jobs and tasks in a work context).

In the O*NET Content Model framework, this situation is rectified by creating sub-groups of KSAOs which can be assigned to the individual jobs. For example, the “Computer and Electronics” knowledge umbrella may include “computer programming”, “Electrical and Electronics Technology” and “Systems Analysis”. This helps in defining a more specific job and competence profile. The question asked here is merely to what extent does this sub-categorisation need to take place? Current literature suggest the O*NET framework enables industry partners to establish a “vertical structured” set of job and people characteristics. The power of such a framework allows each industry partner to determine the appropriate gradation as required to prepare the workforce to meet emerging and unknown market forces.

3. Granularity and Individualism

An individual competency profile is needed in many situations in Human Resource Management. For instance, when describing a profile for a specific job, it is not enough to use generic terms and measures of the job. It would not be satisfactory to define that a person should have a level 6 in “Computer Programming.” However, describing level 6 “Computer Programming” as inclusive of knowledge and skills in C++ and assemble (assemble or assembly?) would define the profile more accurately, facilitating opportunities for automation (e.g., portions of the recruitment processes).



This indicates that a description tool is needed for both the generic and specific KSAO domains. The problem arises from the fact that there are multitudes of specific KSAO descriptors, and it would probably be impossible for any single organisation to oversee the definition and maintenance of such a massive repository.

4. ePortfolios and tag ontologies

This problem is further illuminated when individuals describe their competences, skills, qualifications, goals, reflections etc. Using ePortfolios, it is important that individuals have a means of describing them well, hence the need to describe these attributes at an appropriate level. For instance, if a recent computer scientist graduate wants to describe her programming skills, it is important for her to describe them at the level of detail she finds fitting. In this example, she would likely describe attributes programming in C++, C#, C, Java, and analytical design using UML.

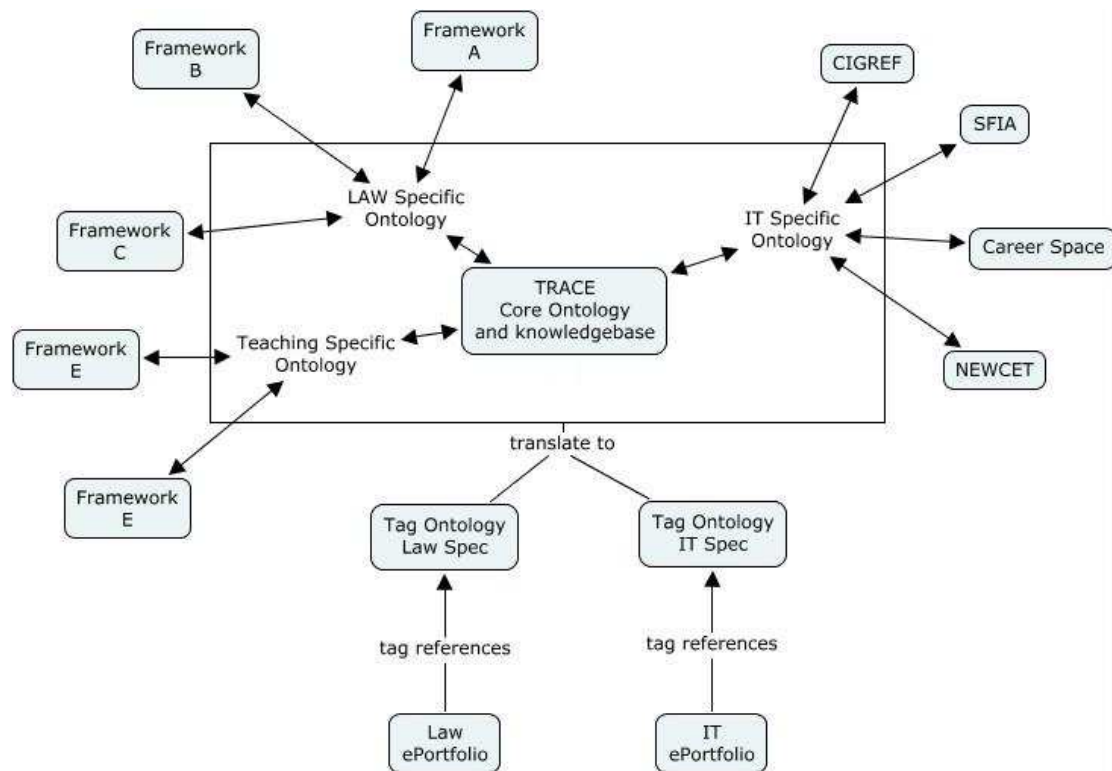
However, if described as above, the TRACE framework would become increasingly complex with such fine grained information added to the model. Moreover, it definitely would not help the translation processes between different competence models, as neither of the models described in CEN (2005) use such a fine granularity. This shows up that a mapping is needed between the individual representation of competencies, as in an ePortfolio and the general TRACE framework.

In an ePortfolio, this could be achieved by using tags which describe the content of the ePortfolio. If these tags are referenced to an ontology that contains relations to TRACE, then the competencies described in the ePortfolio could be translated into a TRACE framework description. This ontology would require regular maintenance and updates using some method of peer review to prevent mistakes and fraud. However, the TRACE framework is not designed to translate from competency descriptions of one individual to another.

The TRACE framework should instead act as a competency broker, translating between competency frameworks. The translation from an individual to the TRACE framework only needs to work in one direction; hence, a less stringent description is needed between the tag ontology and the core ontologies of TRACE. One-way translation is less demanding than a two-way translation, as discovered and described in University of Reading and SkillsNET study (2006).

The following figure describes a system derived from a sketch drawn by Daniel Rodriguez and modified by Karsten Lundqvist during a discussion meeting at University of Reading. The elements within the TRACE box are needed to enable the translations making up the full system, and as such, should be core parts of TRACE.

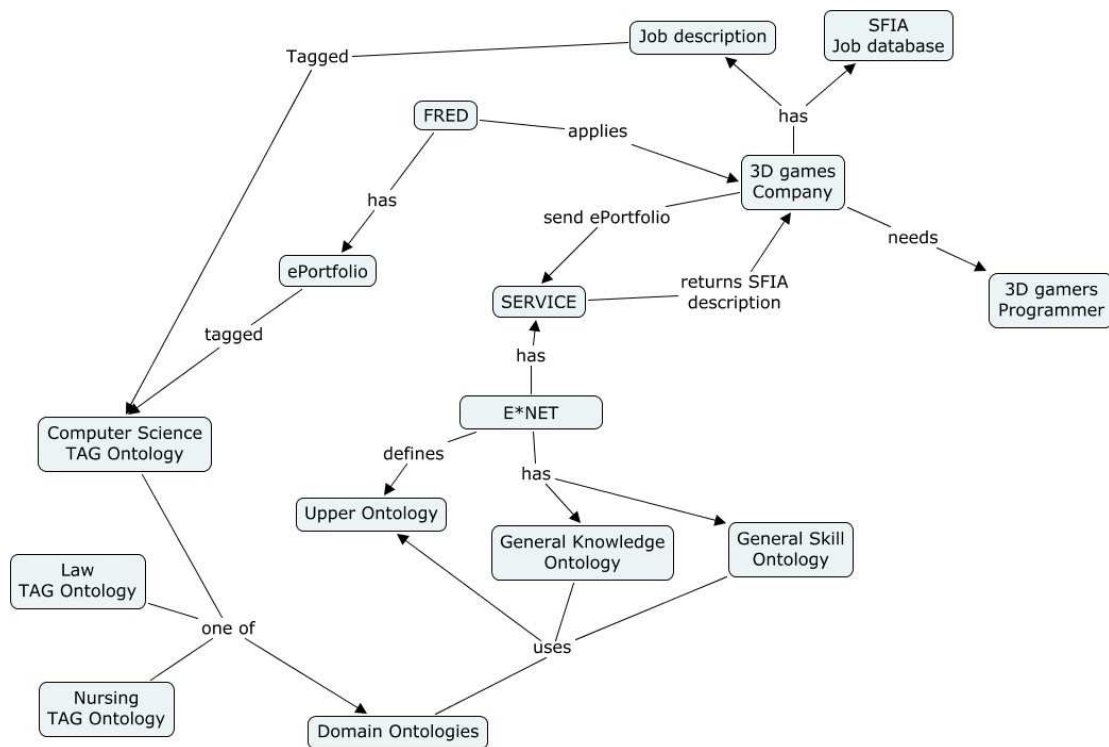
The tag ontologies are key elements of the mapping from an individual to the TRACE system, but should be maintained by independent bodies. Still, TRACE could ease the development and maintenance process by providing useful APIs. The tags also provide extensibility and portability to non-competency management tools/processes and serve as the point of analysis for future rule-base and AI technologies.



To get a more specific look at how such a system might work, the following table was created during a discussion between Shirley Williams, Michael Brown and Karsten Lundqvist. It describes a scenario where an individual ("FRED") applies for a job as a 3D game programmer. FRED has created an ePortfolio, which is tagged using a Computer Science Ontology describing terms and relations within Computer Science and references to the core TRACE ontologies. The services provided by TRACE in this scenario are twofold:

- First, the ePortfolio can be "translated" into a SFIA (UK Standards Framework) or equivalent representation used by the HR department for the generic / general competencies.
- Second, the specific competencies displayed in the ePortfolio are commonly understood by the company's technology personnel as well as FRED himself.

This scenario results in a situation where the company's HR personnel can screen applicants before referring them to technical personnel based on the TRACE KSAO descriptions, finding matches based on more generic competencies and matching ePortfolio tags with specific skills required for the specific job. This leads to a better corporate screening process and a more flexible way for individuals to describe their competences than is possible today.



To develop a common understanding of the relations and terms of the different ontologies within TRACE, there is a need for a top-level or upper ontology as described in Guarino (1997:7). An upper ontology logically describes the different terms and relations that are possible in the task and domain ontologies. By developing an upper ontology, a common logical (and hence, computational) understanding of all the ontologies derived from the upper ontology is created. This ensures that applications and data structures that are designed to use the ontologies can be used with any of the domain ontologies and general ontologies, ensuring interoperability between different applications. With proper upper ontologies specified, it is possible to implement tools for non-technical personnel to define and describe the different domain ontologies, allowing different organisations such as professional bodies to create and maintain these.

References

CEN Workshop Agreement (2005). "ICT Skills Meta Framework"

Guarino, N. (1997). Semantic Matching: Formal Ontological Distinctions for information Organization, Extraction, and Integration. Summer School on Information Extraction.

Lundqvist (2006). Competency Representation, as presented at the TRACE meeting in Reading 2006, Available on the TRACE SharePoint webpage.

University of Reading, School of Systems Engineering (2006). Feasibility of the KSAO Approach in ICT Competency Frameworks.