Introduction

From an organizational perspective, e-Learning can be considered an important component of the Knowledge Management (KM) function, as described by Wild, Griggs, and Downing (2002). In fact, even some architectural guidelines for this integrated view have been described elsewhere (Metaxiotis, Psarras and Papastefanatos, 2002), and the use of reusable learning objects in that context has also been analyzed recently (Lytras, Pouloudi and Poulymenakou, 2002). This perspective puts an emphasis on Web technology-based learning activities inside the organization as enablers of knowledge acquisition activities. In consequence, e-Learning becomes part of a more complex organizational conduct, in which lacks of required competencies trigger the search for appropriate contents or activities (i.e. learning objects), in an attempt to acquire knowledge and abilities that fulfil the contingent or strategic need. The diagram in Figure 1 depicts an abstract, simplified account for Learning Organizations that connect competency management with reuse of learning objects.

Figure 1. Overall view of e-Learning as a component in KM conduct.

As illustrated in Figure 1, the process of acquisition (usually) starts from a business need emanated from the context of the organization, or eventually from strategic management. Such needs trigger the process of
assessing if the organization is in place to deal with them. Such assessment is commonly referred to as ‘Knowledge Gap Analysis’ and essentially consists on matching the competencies required for the incoming needs with the available ones. If the result is not satisfactory, the process of searching for available resources should start. This process may entail the selection of learning objects in external or internal repositories and the composition and delivery of the appropriate learning activities. After these activities take place, some kind of assessment would eventually end up with an update of the registry of available competencies. Finally, the newly acquired competencies could change the position of the organization to offer services or products, closing this way the knowledge acquisition loop.

The critical point of the cycle depicted in Figure 1 is the linking of the knowledge goals of the organization with the knowledge acquisition processes enabled through e-Learning activities, which has been referred to as ‘Learning Map’ (Wild, Griggs, and Downing, 2002). The partial or total automation of this process requires a rich and detailed knowledge representation for expressing needs and available capacities, and this is the point in which ontologies and Semantic Web technologies provide an appropriate infrastructure. But the provision of a flexible and commonly agreed infrastructure for linking competencies to learning objects requires a considerable amount of further work in several directions. Some of these required milestones are sketched in what follows.

### Linking competencies to Learning Object Metadata

The view described so far requires in first place improved learning object metadata annotation that explicitly connects metadata records to ontologies (Sicilia and García, 2004). Current learning object standards and specifications allow in some way this kind of annotations. For example, the Classifications element in IEEE LOM can be used to specify concepts in a ontology. Doing that requires that the Purpose attribute be set to the value competency, and the rest of the attributes in the classification can be used to point to the ontology describing the competencies. Nonetheless, the provision of this metadata element is not mandatory in LOM, and there is not standardized way to provide a score or other kind of measure for the expected outcome. In consequence, a special profile for learning object metadata for acquiring competencies should be required. Such profile could simply include idioms or specific practices for producing metadata that is actually usable and useful in KM processes dealing with competencies.

In addition, shared schemas for describing competences are required, so that the competencies provided in learning object metadata actually produce a consistent and explainable effect in KM systems. The HrXML Competencies schema (Allen, 2003) represents an important step in that direction. But its orientation as a flexible information exchange model has come at the cost of lacking a strict semantics to differentiate skills, knowledge items and competences, and also the diverse types of relationships between competencies - e.g. aggregation versus 'kind-of' as described in (Sicilia, García & Alcalde, 2004) - are not properly addressed. Competency ontologies as those described in (Sure, Maedche, and Staab, 2000; Vasconcelos, Kimble, and Rocha, 2003) may serve to fill the gap of formal semantics that are lacking in proposed standards oriented to data interchange. With the provision of formal ontologies for defining competences, existing catalogues like O*Net could be enabled for expressing common competencies, taking into account the relationships between competencies where selecting target learners or learning contents.

### Summary: Some directions for further work

The Semantic enablement of the competency acquisition cycle depicted in Figure 1 requires further efforts in several directions. The following list summarizes some of the more important and urgent ones:

- Advancing in a shared ontological representation of competencies, by extending current interchange-oriented specifications like HrXML with improved semantics.
- Designing new approaches to learning object metadata that enable a precise specification of the competencies that are supposedly enabled by each learning object in each given organizational context.
• Integrating the KM and e-Learning views in a shared ontology for the purpose of developing Semantic applications that connect the managerial with the pedagogical perspectives.
• Developing advanced semantic tools for competency definition and for the assessment of knowledge gaps, taking into account relationships between competences, and also the imperfect nature of competency evaluation.

References


