A conceptual framework for the integration of the 2.0 Web Tools in Lifelong Learning Scenarios

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Abstract—The emergence of the Web 2.0 technologies in the last years have changed the way people interact with knowledge. Services for cooperation and collaboration have placed the user in the center of a new knowledge building space. The development of new second generation learning environments can benefit from the potential of these Web 2.0 services when applied to an educational context. In this paper we present a conceptual framework that relates Web 2.0 services with functional requirements in learning environments. In particular, this framework helps selecting the most appropriate bundle of Web 2.0 services for a lifelong learning scenario.

Keywords—Web 2.0 services, Knowledge Resource System Management (KRSM), lifelong learning, Activity Context (AC), Knowledge Object (KO)

I. INTRODUCTION

The Web has now become a user-centered platform for managing and manipulating information. The newly emerging tools and services that allow users to create and share their own resources have changed the way that people interact and have generated a new space for knowledge building based on the users’ collaboration and cooperation [1], [2]. One of the main problems in this scenario is to understand how these complex interactions can be emulated in a learning context to benefit the knowledge acquisition process. Some studies propose methodologies and mechanisms to introduce Web 2.0 services into education to enhance collaboration and facilitate content generation [3], [4], [5], [6], [7]. However, in a lifelong learning context learners have different interests and they look for knowledge adapted to their specific requirements. This diversity makes the conceptualization of a common integrated Web 2.0 platform covering the learner’s necessities a complex task. In the framework of the TENCompetence European Project1 a Knowledge Resource System Management (KRSM) is proposed as an accessible space for creating, discovering and sharing resources adapted to the learners’ diversity [13]. The KRSM’s functional requirements reflect the educational needs that are covered in this scenario. Hence, the motivation behind this work is to select and adopt adequate Web 2.0 services so that they can be integrated into a platform for supporting these functional requirements.

We propose a conceptual framework that relates Web 2.0 services for their integration in learning environments and the educational needs that learners express in different activity contexts (AC). A selection criterion is drafted from the framework and applied to a large collection of Web 2.0 services. It is expected to facilitate the selection of adequate bundle of services offering the required functionalities for a KRSM. The result is a Web 2.0 tool map adapted to a lifelong-learning scenario.

This paper is structured as follows. In section II we describe the derivation process of the KRSM’ educational interaction framework. In this same section we also introduce the concept of Knowledge Object as the basis for the Web 2.0 tools classification. Section III describes a Web 2.0 services’ selection criteria and a proposal for its application. Finally, the main conclusions and the future work are included in section IV.

II. IDENTIFYING THE KRSM’ ACTIVITY CONTEXTS

We perform an analysis of the main educational needs of the users in the KRSM scenario and derive a set of particular activities required to address these needs. The functional requirements that arise from the educational needs are described through a set of activities referenced by “scenario activities” in the context of the TENCompetence project [8]. In parallel, we infer a set of more generic activities by studying the activities covered by a wide range of previously indexed Web 2.0 services. We call them the primitive activities since they are generically supported by Web 2.0 services. The scenario activities are mapped to the primitive activities in order to study the compatibility of different collections or bundles of Web 2.0 services with the functional requirements of learners. Consequently, the learners’ educational needs are mapped into the KRSM scenario [8]. In total, 10 primitive activities have been identified and are presented in Table I.

<table>
<thead>
<tr>
<th>ACTIVITIES</th>
<th>PRIMITIVE ACTIVITIES</th>
<th>DESCRIPTION OF A SITUATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEARCH RESOURCES</td>
<td>Search/Find/Explore</td>
<td>Search for familiar or new resources</td>
</tr>
<tr>
<td>EXPLORE CATEGORIES</td>
<td>Filter/Sort</td>
<td>User filters to sort available resources</td>
</tr>
<tr>
<td>PUBLISH</td>
<td>Publish/Upload/Share</td>
<td>Upload personalized resources to public system</td>
</tr>
<tr>
<td>BOOKMARK</td>
<td>Bookmark</td>
<td>Guard a reference to a specific resource of interest</td>
</tr>
<tr>
<td>EDIT RESOURCE</td>
<td>Edit/Write/Create</td>
<td>Create a new resource or edit an existing one</td>
</tr>
<tr>
<td>RATE RESOURCE</td>
<td>Rate</td>
<td>Associate an evaluative scaled rating to a given resource</td>
</tr>
<tr>
<td>ADD TAG</td>
<td>Tag</td>
<td>Label a resource with a representative concept(s)</td>
</tr>
<tr>
<td>COMMENT RESOURCE</td>
<td>Comment</td>
<td>Add comments to a resource</td>
</tr>
</tbody>
</table>

1 http://www.tencompetence.org
Next we cluster these educational needs in three ACs according to the nature of the activities they engender: (1) Knowledge mining, domain where learners search, filter and sort resources; (2) Knowledge transfer, related with activities that contribute to the expansion of the collections of resources and (3) Knowledge personalization, encompasses the activities that the user performs in order to organize and sort collected resources. We then relate the three ACs with the primitive activities using the mapping between primitive and scenario activities (Figure 1). We associate the different ACs with the stages of lifelong competence development defined in [8] in order to define the types of data and resources manipulated in each AC.

The results are three largely independent ACs (Figure 2). In these ACs, the learner interacts with resources through different primitive activities determined by the interaction goal. This association among the primitive activity and the interaction goal allows us to determine the type of resources that are manipulated in each AC, which will be referred to as Knowledge Objects (KO).

We define the KOs as an extension of the concept of Learning Object defined in [9]. In this sense, a KO is a digital resource that the user creates, manages, distributes, and/or edits using the KRSM in the different ACs. A dozen types of KO are treated in by the KRSM and these include units of learning, questions and answers, media (videos, images…), discussions, blog posts, comments and others. Some of these types are only supported within a single AC while others are used in all. The KRSM will hence integrate only those Web 2.0 services able to support the types of KOs treated in the KRSM’s ACs.

Finally, we obtain an AC schema in which each context corresponds to one of these settings and is represented by the set of primary activities it encompasses and the types of objects that can be treated. **Error! Reference source not found.** shows the three ACs defined for the KRSM and their inherent primitive activities.

### III. Drawing a selection criterion

A list of Web 2.0 services with potential compatibility with the KRSM’s functional requirements has been previously drawn [11]. Hence, in order to choose the right bundle of services from this list, we rely on contrasting these services against the KRSM model formed by the three ACs identified along with their associated primitive activities and KOs.

Since most of the list’s content is related to the KRSM scenario, it becomes necessary to develop a selection criterion that orders the services at hand according to their compatibility with the KRSM’s functional requirements. First, the list is filtered according to set of conditions discussed hereafter:

- All services having functionalities that prove as incompatible with the design of the ACs and their schema should be disregarded.
- A service is selected if its functionalities cover the maximum number of primitive activities inherent in an AC.
- A service is selected if it handles the number of KOs treated in this same context.
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- The set of Web2.0 services selected for a given context should be minimized.

Second, we propose a set of selection steps for choosing those Web 2.0 tools that offer the best fit with the pedagogical needs represented by the KRSM scenario. Since the KRSM should provide a way to manage KOs using existing Web 2.0 services, we can either: (1) look for a Web 2.0 service for managing a concrete type of KO or (2) for one that offers functionalities to treat a specific set of primitive activities. We propose two ways of applying a selection criterion:

Activity-centered criteria:
- The service has to offer the functionalities to cover the selected primitive activity.
- The best service would be the one that covers the maximum number of KOs for the selected primitive activity.
- Follow steps 1 and 2 till you reach the constraint.

KO-centered criteria:
- The service has to cover the maximum number of technical requirements of the selected KO.
- The service would be that one that covers the maximum number of scenario activities which treat the selected KO.
- Follow steps 1 and 2 till you reach the constraint.

For example, Table II shows a list of services associated with the KRSM scenario. In order to select a set of services that answer the KRSM functional requirements, the available options have been mapped to primitive activities and compared. According to the selection criterion previously discussed, two services (Delicious and Drupal) represent the smallest set of services that covers all the functional requirements of the required system and treats all the inherent KOs types.

### TABLE II. TABLE OF WEB 2.0 TOOLS AND KOS APPLYING THE LIST OF CONDITIONS.

<table>
<thead>
<tr>
<th>Services</th>
<th>KNOWLEDGE MINING</th>
<th>KNOWLEDGE TRANSFER</th>
<th>KNOWLEDGE PERSONALIZATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Filter/Sort</td>
<td>Search</td>
<td>Publish</td>
</tr>
<tr>
<td>GroupMe</td>
<td>X X X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Flickr</td>
<td>X X X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Delicious</td>
<td>X X X</td>
<td></td>
<td>X X X X</td>
</tr>
<tr>
<td>Drupal</td>
<td>X X X</td>
<td>X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Youtube</td>
<td>X X X</td>
<td>X</td>
<td>X X X X</td>
</tr>
<tr>
<td>Diigo</td>
<td>X X X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IV. CONCLUSION AND DISCUSSION

In this paper we have discussed a framework for the selection and integration of Web 2.0 services in a technology supported learning environment, namely the KRSM. Our methodology is based on modeling the system in development in accordance with the primitive activities inherent in its functional requirements and the types of KOs treated. The identification of ACs helps in defining system components that can be mapped onto existing Web 2.0 services. This methodology allowed the rapid conceptualization and integration of a KRSM system called LearnWeb2.0. By studying the implementation of this tool, other requirements have been extracted for classified Web 2.0 services in the context of a KRSM system. Our future work is to evaluate the LearnWeb2.0 tool with real users and to further evaluate and validate the proposed framework.

ACKNOWLEDGMENT

This work has been partially funded by European Commission in the TENCompetence project (IST-2004-02787). The authors would also like to thank other members of the Interactive Technologies Group at the Pompeu Fabra University for their support and ideas.

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