Toward Increased Discoverability of Open Educational Resources and Open Courseware

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Abstract— **The success of Open Educational Resources (OERs) and Open Courseware (OCW) initiatives worldwide, which has resulted in a huge number of online instructional resources and repositories available freely, comes with a constant challenge, i. e. locating and retrieving the educational resources that are the most relevant for a specific user's need, in a particular context, and that have the best quality. In this paper we provide an overview of opportunities for discovering OCW and OERs, which includes the most comprehensive repositories, the OCW/OER compilations of instructional repositories and indicative educational websites, and the most powerful custom search engines for OCW and OER.**

Keywords— **open courseware; open educational resources; repositories; consortia; custom search**

I. INTRODUCTION

Both open courseware and open educational resources movements have started more than ten years ago, and their contribution on helping equalizing *the distribution of high quality knowledge and educational opportunities for individuals, faculty, and institutions* [1] worldwide using the opportunities offered by information and communication technologies, is growing stronger every day. However, the success of these initiatives, which has resulted in a huge number of online instructional resources and repositories available freely, comes with a constant challenge, i. e. *locating and retrieving* the educational resources that are the most relevant for a specific user's need, in a particular context, and that have the best quality.

In this respect, the recent 2012 Paris Open Educational Resources Declaration recommends that future support is needed for *facilitating finding, retrieving and sharing of OERs, for fostering awareness and use, for facilitating enabling environments for use of ICT, for reinforcing the development of strategies and policies, for promoting the understanding and use of open licensing frameworks, for supporting capacity building for the sustainable development of quality learning materials, for fostering strategic alliances, for encouraging the development and adaptation in a variety of languages and cultural contexts, for encouraging research, and for encouraging the open licensing of educational materials produced with public funds* [2].

Hence, even though teachers and learners (enrolled students or self-learners as well) get more and more support in finding the right educational resources, for unsophisticated users it continues to be challenging to reach the most appropriate resource that matches their particular interest at a given time. In this paper we provide a taxonomy of searching, browsing, and retrieving opportunities for OCW and OERs, which includes the most *comprehensive repositories* (such as OCW MIT, OER Commons, OCW Consortium, Saylor Foundation, Connexions, Universia, Webcast.Berkeley, Open.Michigan, Textbook search, etc.), the *OCW/OER "commonplaces"* (compilations of instructional repositories and "point-out" educational websites), and the most powerful *custom search engines* for OCW and OER (organization or company supported such as Google Custom Search or yahoo pipes, or individually maintained). Up to our knowledge, there are yet no taxonomies with respect to the opportunities that users have when searching, browsing, and retrieving open courseware and open educational repositories.

Several works in the literature overview briefly some of the most well-known OCW/OER Repositories [1, 3, 4, 5, 6, 7a, 8, 9]. In [4] the authors address also the issue of integration of heterogeneous educational services, analyzing standards, tools and infrastructures, and report on several important approaches of integration of distributed storage places into federated applications, aiming at a creation of a Web-scale interlinked educational data infrastructure. A categorization of OER providers is shown in a Cartesian space divided by Scales of operation and Provider axes in [7b]. Thus, on the one hand, open content may be provided by large-scale, institution based or supported initiatives (MIT OCW, OpenLearn), or large scale, non-institution based ones (Wikipedia), and on the other hand, there are small scale either institution-based or community-sustained projects.

The structure of the paper is as follows: the second section presents OCW/OER repositories and consortia, the third one introduces the OCW/OER compilations and indicative websites, while the custom searches are illustrated in Section 4, and the last section includes some conclusions and future work ideas.

II. OCW/OER REPOSITORIES AND CONSORTIA

In this section we overview briefly the main repositories that contain open courseware and OERs, along with the major consortia that include universities and other educational organizations and institutions, which are involved in the open sharing of instructional materials worldwide. First to be considered, of course, is MIT OCW [10], *the web-based free publication of virtually all MIT course content,* with which has started everything. Almost all the undergraduate and

graduate subjects taught at MIT are illustrated with course materials, and currently, instructional materials from 2150 courses are available, with more than 1000 translated courses, and more than 150 million visits, coming from approximately 70 million unique visitors, as reported in September 2012 (last monthly report available) [10]. MITx is pursuing further MIT's *commitment to the dissemination of knowledge for the public good* [10, 11, 12], by offering content that is designed specifically for the online platform, showing much more interactivity, and allowing completion of assignments and exams, receiving grades and getting feedback. MITx courses are available via edX, a joint enterprise of top universities *that features learning designed specifically for interactive study via the web* [13].

The Open University (OU), a major distance teaching and learning university, has launched in 2006 OpenLearn, which allows free online education, open to anyone, anywhere in the word, and which has had 23 million visits since its launch. Moreover, the site averages 400,000 unique visitors a month, and has around 11,000 hours of learning materials. In addition, those learning materials may be accessed, studied, discussed with others, etc. by using free learning tools for collaboration within OU's Learning Space [14, 15]. Jorum, a free online repository service that provides for collecting and sharing learning and teaching materials, allowing their reuse and repurposing, is located in UK as well. Currently, it includes more than 17500 resources [16].

The Saylor Foundation launched Saylor.org in 2009, as a free online university [17]. For the time being, the effort is focused to the appropriate content delivery that is necessary for a student to know in order to earn the equivalent of a degree in any of the top majors in the United States. Currently, there are available course materials for 281courses. Recently they have added a very interesting capability for guiding user searches: *the content matrix*, in which users may see, at a glance, specific details about the materials included in the courses. These details show whether the material is peer reviewed or not, how much of the course content is hosted, whether a textbook or lecture series fully aligned with the course is available, whether a course makes significant use of activities, such as interactive modules and games, quizzes, or other assessments, and, finally, if a final exam has been developed for that course.

Other major open educational resource provider is *Connexions* [18], which is a non-profit start-up hosted by Rice University since 1999, which provides both an open source platform and an open access repository for OERs, and which enables creating, sharing, modifying, and vetting of open educational materials that are accessible online to anyone, anywhere, and anytime. Currently, 21574 reusable modules woven into 1293 collections are available. Long term sustainability of Connexions is ensured by The Connexions Consortium, which was formed in 2009, and includes over 20 members – universities, community colleges, foundations, and NGOs – from several countries [19].

The OpenCourseWare Consortium (OCWC) is a collaboration of HE institutions, organizations, and associate

consortia aiming at *creating a broad and deep body of open educational content using a shared model* [20]. Users may search within a large variety of high quality university-level educational materials. Currently, the search index contains 6,974 courses from 65 sources in 19 languages. Similar consortia are Universia, Japan OCW Consortium, Taiwan OCW Consortium, Korea OCW Consortium, etc., which are presented in more details in [21, 22].

MERLOT is a free and open online community of resources designed mostly for faculty, staff and students of HE worldwide to share their learning materials and pedagogy. MERLOT includes a user-centered collection of peer reviewed online learning materials, catalogued by registered members and a set of faculty development support services, which are developed continuously in direction of building and sustaining online academic communities, of innovative initiatives for online teaching and learning, and of building, organizing, reviewing, and developing applications of online instructional materials [23]. Coursera offers freely a large variety of online courses in several domains (for now, there are 329 courses). Special care is given to the sound pedagogical design of their courses, aiming at helping users master new concepts fast and effectively [24].

A very consistent repository for open instructional resources is *Open Education Resources (OER) Commons* [25], which provides access to a database of links to a large number high-quality resources (43,578 in March 2013) located on other websites, coming from over 120 major content partners, which can be searched, browsed, evaluated, or discussed within OER communities. Recently, Achieve has teamed up with OER Commons, and they had provided an online evaluation tool that can be used to evaluate the instructional resources available on the website. The resulted information will be stored in a pool of metadata, and it will be shared through the Learning Registry with other interested repositories [26, 27, 28].

For the time being, we consider open textbooks, open access publications, and open access repositories that contain research paper (such as arXiv) also as OERs in general, based on the fact that many of them are available via OER consortia or repositories (such as open textbooks available from OER Consortium[1] or from Saylor.org[2]).

III. OCW/OER Compilations and indicative websites

Several web sites present compilations of URLs of OCW/OER Repositories. These can be very useful to users, especially unsophisticated ones, when they are interested in best places to start their search for open educational resources or open courseware. Some are maintained by individuals, while others are sustained by organizations or companies. We overview some of these web sites further on. Some of the websites maintained by individuals or small teams are: (1) *Zaidlearn*, which present 250 links to various open educational repositories grouped by several criteria: category,

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[1] http://oerconsortium.org/discipline-specific/

[2] http://www.saylor.org/otc/

domain, degree level, continent, etc. [29]; (2) *Mission to learn* where 100 free places to learn online are presented, being grouped in various categories: online tutorials, how-to-sites, Higher Education, open education initiatives, topical areas and so on [30]; (3) *Learning by doing,* which point to 60 open topic-based collections for web designers [31].

The second class includes web sites that present compilations made by organization or companies, such as (1) *Open Education Database (OEDB),* which offers various lists: top 100 open courseware projects (grouped by domain), 236 open courseware collections, podcasts and youtube channels (archives, broadcast learning, e-books and e-texts etc.) [32], (2) *Mastersdegreeonline.net* that has collected together the best 100 OER repositories [33], (3) *Distancedegree.com,* which has gathered in one place 100 sources for free online books and texts grouped in categories such as: classics, academics resources, children resources, religious texts [34], etc.

Besides the websites that post compilations of OCW/OER Repositories, there is another category of educational portals that gather URLs of several pieces of courseware stored elsewhere, and group them by several criteria: topic, degree level, source etc. Such websites indicate to the original source of each courseware. In this case also, some of them are maintained by individuals or small teams, and others are maintained by organizations or companies. Few examples in this category include: (1) *OEDB*'s list of 200 free online classes "to learn anything" [32], (2) *OnlineCourses* that gather over 500 courses from top universities worldwide [35], (3) *Open Culture* that showcases 700 free online college courses and lectures from top university professors, grouped by domain [36]. First two indicative websites are organization- or company-sustained, while the third one is managed by a small team of individuals, working voluntarily on this project.

IV. OCW/OER CUSTOM SEARCH

In this section we overview the most well-known OCW/OER custom search opportunities either sustained by organizations or companies or by individuals (we particularize our search using the word "database"). First, there is Google Custom Search that may be adapted for OCW/OER Search. Users may create their own search engine that is focused on particular subjects and acts on websites chosen by the creator of the custom search engine. This custom search engine may be accessed from any webpage where is attached. So, users may use the custom search created by others or create their own (see Z. A. Alsagoff's in Fig. 1) [37]. The horizontal menu allows various selections, namely users may select only resources that are open courseware, or that contains podcasts (the results under which appear the text "labeled podcasts" actually point to a podcast resource, while the others only contain the search term "podcast").
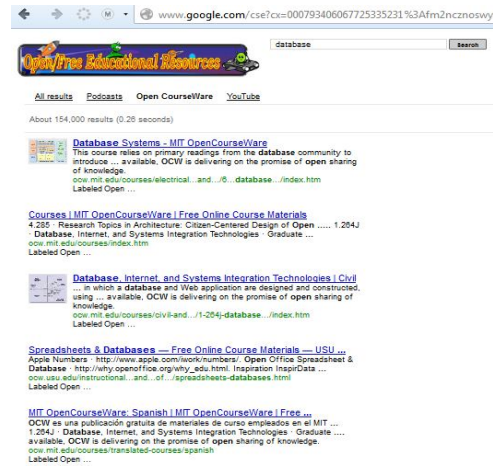

Figure 1. Google Custom OCW/OER Search

A similar customized search may be performed using Yahoo pipes. Users may use a search pipe created by others [38] or create their own (see Fig. 2). Pipes offer a *powerful composition tool to aggregate, manipulate, and mashup content from around the web* using a visual editor, and allows, among others, to combine many feeds into one, followed by performing sorting, filtering, and translating it. Users may save (clone) pipes created by other users, and they also may save a list of favorites. Other valuable options are available, e. g. (refined) searching and browsing among the saved pipes, discussing them on various social networking services etc.
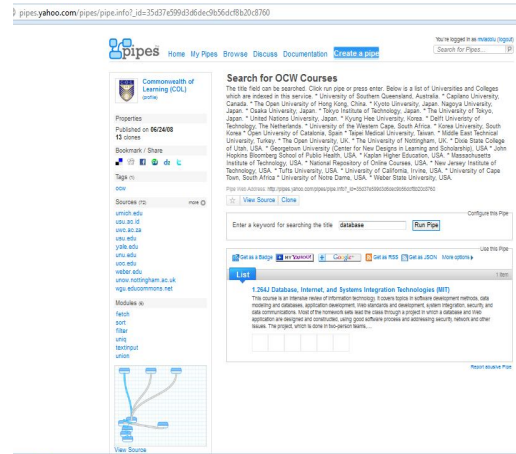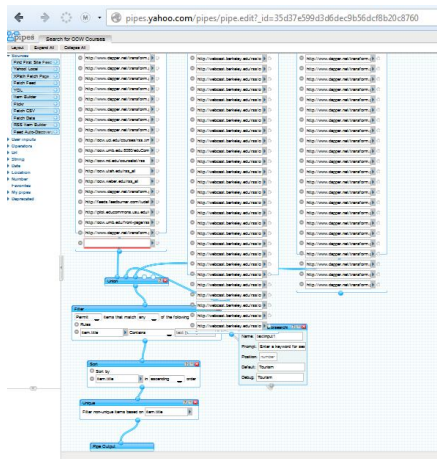
Figure 2.   Yahoo pipes: a particular search (up) and the pipe source (down)

Another useful opportunity is offered by another individual, P. Far [39]. His search engine searches in ten important OCW repositories (Figure 3). In 2011, after taking a Google position, he has donated the OCW Search to the OCW Consortium. A blog is available, as well as information about the two API available that help users tap into the collected data for empowering the searching service: OCW Search API, which allows integration between search results and user applications, and OCW Search MetaData API that provides full access to the metadata about each course in the index.

Figure 3.   Far's OCW Search Engine: home page (left) and a particular search (right)

V.   CONCLUSIONS AND FUTURE WORK

In this work we have been concerned with the opportunities that users have when it comes to searching, browsing and retrieving open educational resources and open courseware. After discussing and exemplifying each opportunity, we have articulated a first draft taxonomy that may useful both for users looking for instructional resources, being them learners, teachers, designers, faculty etc., and for scholars researching open education. As future work, we intend to keep up to date our taxonomy, as the change pace in this field is very fast.

First, we think about including open textbooks, open access publications, and open research paper repositories available in separate categories of our taxonomy, as they, each, have specific features that distinguish them significantly from general OERs. We also intend to include in the taxonomy any other tools, materials, or techniques used to support access to knowledge that are also OER according to The William and Flora Hewlett Foundation definition's of open educational resources [40].

Moreover, we plan to integrate these results with our work on quality of open courseware and open educational resources, aiming to provide users with an integrated framework for accessing and using these resources. The first step to do is developing a framework for recommending OCW and OERs based on the retrieving taxonomy introduced here and on the quality model introduced in our previous works

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