

Evaluating Simple Repository Deposit for Open Educational Resources

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Abstract. The rise of technologies and simpler software tools have been identified as drivers for the Open Educational Resources (OER) movement. However, content creators have been slow to adopt current OER solutions, as is shown by weak repository deposit rates and activities. To begin to address this, a desktop tool that simplifies the deposit process and that can be integrated into the content creation workflow was created. The goal of the tool was to support metadata that could accurately describe OERs and to ensure that, when deposited using the tool, OERs were represented correctly in the repository. Evaluation of the tool by users showed its potential in simplifying the repository deposit process, encouraging the creation of OERs and motivating content creators to share. Furthermore, users were also able to represent OERs using the adopted metadata standard and were satisfied with the way in which their OERs were represented in the repository.

Keywords: open educational resources, repository, deposit, desktop

1 Introduction

Open Educational Resources (OER) are digital objects or materials offered freely and openly through open licenses for educators, students and self-learners to use and reuse for teaching, learning and research [1]. The OER movement has encouraged many initiatives and projects that have assisted in its growth; however, there is a continuous need for simpler solutions to assist in many aspects of OER and an exploration of the challenges facing OER in 2008 expressed a current and long term need for more advanced tools and services for educational repositories [2]. Most OER repositories and applications are provided to encourage sharing, reuse, and re-purposing of teaching and learning materials. However, in many cases, deposit activity remains weak [3]. A possible reason could be that the amount of effort that is currently required to deposit OERs may be a contributing factor to this problem. To begin addressing the technical aspect of this problem, the Open educational Resources Depositor (ORchiD) was built. ORchiD is a desktop application that integrates open standards for deposit and content delivery to easily and simply ingest resources into repositories. ORchiD

was designed to form part of the content creation workflow, such that, instead of needing to access an external website to add content to a digital repository, users can simply drag the content to the ORchiD interface on their desktop, which then handles the submission of the content to a repository, thus simplifying the entire submission process.

In discussing this application, the rest of this paper is structured as follows. Section 2 discusses related work. Section 3 then presents a detailed description of ORchiD followed by its evaluation by means of a controlled user study in Section 4. Finally, conclusions are drawn in Section 5.

2 Related Work

Several systems and applications attempt to integrate repositories with the desktop to simplify or enhance deposit of resources into repository systems. Some of these projects were created for specific file types and others for specific systems. These projects are diverse and some are directed at certain communities or organizations. For example, Microsoft Research¹ developed a plug-in for Microsoft Word to improve resource discovery and publication by integrating the writing process and metadata associations. The work was aimed towards the National Library of Medicine's PubMed Central² repository. The plug-in allows users to create and manipulate metadata in the National Library of Medicine's XML format. This project uses the SWORD protocol and allows users to deposit Word documents to SWORD-compliant document repositories [4].

Another project, The Modus Operandi for Repository Deposits (DepositMO), aims to extend SWORD to enable features such as resource discovery and synchronization. The project is developing tools for Word 2010 to deposit directly to repositories and for desktop management systems to drag and drop into a folder that instantly synchronizes with a repository location that is set up by the user [5]. These projects, even though directed towards authors or users, seem to have concentrated on documents produced in Microsoft Word and thus do not generalise to other types of digital objects, such as heterogeneous OERs.

Other projects, like the Open Access Repository Junction (OA-RJ), are aimed at assisting publishers. The main concept is to allow publishers to deposit into multiple repositories at once instead of performing one on one deposits to various repositories. The goal is to do this while maintaining one-to-one relationships between publishers and repositories. In other words, the publisher works with one interface (OA-RJ) instead of interacting with varying repository interfaces that usually have different requirements [6].

With metadata creation being one of the reasons behind the complexity of the deposit process, Direct User Repository Access (DURA) focuses on integrating the institutional deposit process with the researcher's workflow. DURA specifies metadata collection techniques by integrating systems like Mendeley with the institutional repository [7].

¹ <http://research.microsoft.com/>

² <http://www.ncbi.nlm.nih.gov/pmc/>

While other applications attempt to simplify repository deposit through other Web applications, integrating the desktop or even easing metadata creation, there seems to be a lack of such applications for Open Educational Resources, which are relatively complex due to the variety of the types of resources and metadata that exist. Thus, ORchiD attempts to integrate the repository and the desktop with the content creator's workflow to simplify the deposit of complex OERs to repositories.

3 Design

ORchiD's design was based on a number of design considerations, such as: the use of a standard digital library system as a repository that has been configured/modified as necessary to meet requirements; the support of a wide variety of digital objects; the use of a metadata standard that appropriately represents the digital objects; and the packaging of digital objects for their deposit. In light of these design considerations, the decision was made to use EPrints as a digital repository and the Learning Object Metadata (LOM) standard for metadata, since it was specifically designed to cater for learning objects [8]. Furthermore, the digital objects and metadata are packaged using the IMS Content Package standard [9] and the packages are submitted to the repository, which handles the metadata extraction and ingestion of the object.

In this section, the design of ORchiD is discussed, including: the ways in which EPrints was modified to accommodate the digital objects and metadata; the ways in which the digital objects are ingested into the EPrints repository; and the ORchiD interface. The design can be effectively split into two sections: the repository and the desktop application.

3.1 Repository

As already mentioned, EPrints was chosen as the repository for use with ORchiD. However, a number of changes needed to be made in order to adapt EPrints such that it was suitable. These changes included: increasing the file types supported by the repository; adjusting the repository to comply with the LOM metadata standard; the creation of an import plugin to translate the metadata into EPrints XML files; and the allowing of remote deposit via a SWORD interface. These are discussed below.

Additional File Support. By default, EPrints does not support all file types that may be used for OERs. Thus, the EPrints repository was adapted to support additional MIME types, such as 3GPP, Java source files, Open Document Formats, DJVU and Real Media.

Metadata Support. An object in EPrints is known as an *EPrint* and a metadata element is referred to as an *EPrint field*. EPrints was modified so that each LOM field was represented as an EPrint field. This allows for all of the LOM fields to be accommodated and not discarded during the importing of metadata.

Import Plugin. A default installation of EPrints includes a set of import plugins, including an IMS import plug-in. However, the plug-in only ingests the title and description fields and maps them to the EPrints metadata fields of title and abstract respectively. Furthermore, the metadata XML file is also stored, thereby avoiding loss of metadata; however, besides the title and description fields, the remainder of the metadata fields are not represented. For this reason, the IMS import plugin was modified to read the rest of the metadata fields and map them to the new EPrint LOM fields. The IMS import plug-in takes a package sent by a client as input, which contains the metadata XML file and the actual digital object. The metadata fields are then mapped to their corresponding LOM fields in the repository and the digital object is added to the repository.

Remote Deposit. In order to allow for remote deposit to a repository, the SWORD plug-in for EPrints was used. The plugin supports the use of HTTP Basic Authentication and HTTP Post to provide the client with the ability to interact with the repository. The client is able to authenticate a user, retrieve a service document and deposit a supported package that contains a resource with its metadata.

With these modifications to a standard EPrints installation, the repository is able to support the type of interactions required for heterogeneous OER deposit via a remote application. In the next section, the desktop application that allows users to deposit content into the repository is described.

3.2 ORchiD Desktop Application

The ORchiD desktop application consists of five main components that allow for OERs to be remotely deposited into a repository: the *Resource handler*; the *Metadata entry form*; the *XML writer*; the *Packager*; and the *SWORD client*. Figure 1 shows the main components of ORchiD. The user interacts with ORchiD through a desktop user interface. These components are described in this section.

Resource handler. The desktop application window contains a list component where the resource files the user chose are listed. The user is presented with two ways to add a file to the list: one way is to drag the resource from the desktop and drop it onto the list component; the other way is by clicking on a button that displays a standard file selection dialogue in which a file can be selected and added to the list.

The Metadata entry form. The LOM data model specifies a hierarchical, structured set of elements. A LOM instance consists of nine categories and each category consists of a number of data elements that describe a learning resource. The desktop application provides the user with a form allowing the entry of element values. The elements have different data types, some have sub-elements and some have controlled vocabularies that the entry form accommodates. Due

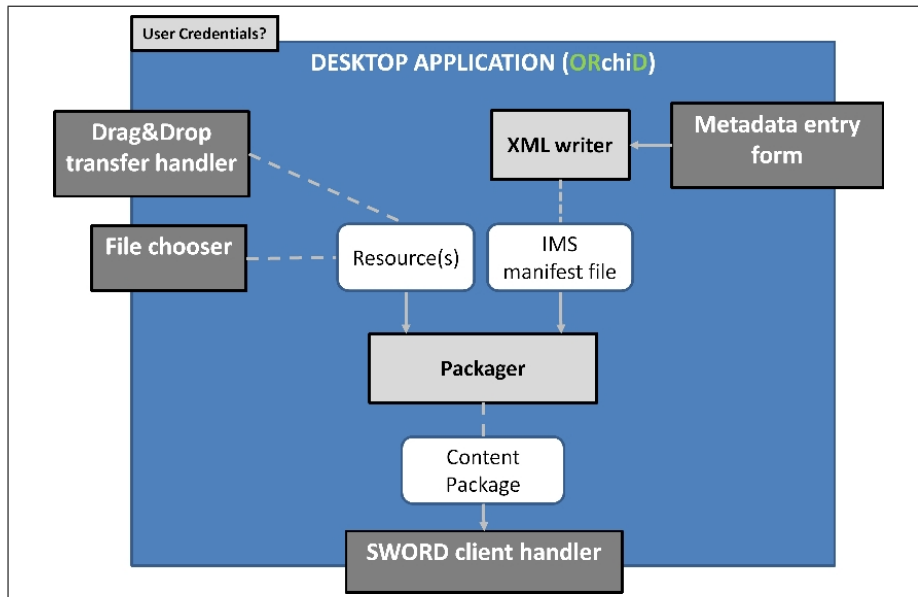


Fig. 1. Components of the ORchiD desktop application

to the complexity of the IMS specification, the application offers an option for the user to enter values for fewer elements. Other than the basic user credentials, the **Title** and **Description** fields are the only required fields in the data set used in this application. After the user has filled in the desired fields and selected or chosen the educational resources, a deposit button is clicked to initiate the deposit process.

XML Writer. The main purpose of this component is to create the IMS Manifest file (*imsmanifest.xml*), which contains a list of resources in the package, after a user had selected a resource, entered the metadata and clicked the **Deposit** button to initiate the deposit action. The *XML writer* takes the entered values, creates an XML document and writes the values entered by the user to their appropriate places. The *XML writer* sends the *imsmanifest.xml* to the *Packager*.

Packager. The application complies with the IMS Content Packaging specification [9] with this component. The specification states that a package, in a standard Package Interchange format, includes an IMS manifest file and resource(s). This component packages the metadata file created by the XML writer and the resources selected by the user into a zip file. The package is forwarded to the SWORD client, which handles the depositing of the package into the repository.

SWORD Client. The SWORD client submits a package to a SWORD server at the repository as a bit stream using an HTTP POST request. The post includes a

header that contains user credentials, the type of the package and the bitstream that is the package itself. When the package is received, the server sends a response back to the client about the success or failure of the deposit.

User Interface. The desktop user interface is what the user uses to actually deposit files into the repository and perform the actions provided by ORchiD. The design of the interface was based on a focus group in which 5 postgraduate students, all of whom worked in the field of digital libraries, discussed what they would expect from a simple repository deposit tool for OERs. The interface consists of three main panels: a login panel for credentials and a deposit location; a main panel to add resources and required title and description attributes; and an optional details panel to select and add more metadata. The design of the user interface is minimalistic and simple to allow users to simply and easily deposit data. Figure 2 shows ORchiD's main panel.

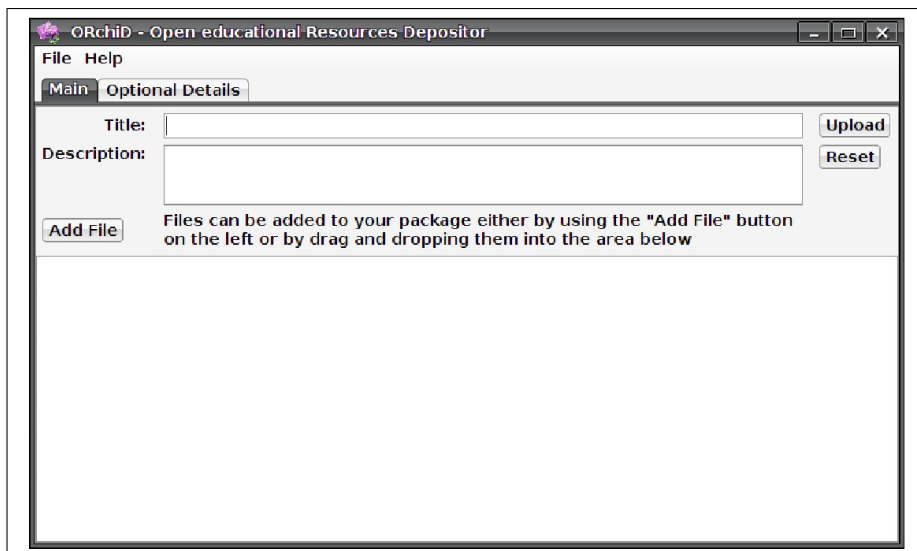


Fig. 2. Main panel displayed after a successful login

4 Evaluation

An online experiment was conducted to evaluate ORchiD. Invitations to participate were sent to 178 individuals from around the world and from many institutions and organizations. The survey received 25 complete responses and, while the number of respondents was not very high, it was felt that it was still sufficient to give insight into whether or not ORchiD could simplify the repository

deposit process for complex OERs. About half of the survey respondents were academics, while the other half was made up of teachers, educational technologists and people in other educational roles. All users had previous experience in depositing or sharing resources. Users were asked to perform two tasks: deposit any single resource, like a text document or a picture, into an EPrints repository using the ORchiD interface; and deposit a collection of resources, such as all slides for a course. The goal was to test real world scenarios, such as a teacher wanting to deposit notes or slides at the end of a lecture or a course convener wanting to share course resources at the end of a semester. Users were then asked to check the EPrints repository via the Web interface to see if the OER representation was as expected. After these tasks, the users completed a survey, which asked them to agree or disagree with statements regarding ORchiD in terms of: their experience using ORchiD; the metadata representation used in ORchiD; the representation of the data when viewed with the EPrints Web interface; ORchiD's difficulty compared to the interfaces of other digital library systems; and comments in general. The levels of agreement were on a scale of 1-5, representing *Strongly Disagree*, *Disagree*, *Neutral*, *Agree* and *Strongly Agree* respectively, while 0 represented *No Answer*. The results of the survey are presented below.

4.1 User Experience

Table 1 shows the levels of agreement that users had with various statements regarding their experience when using ORchiD.

Table 1. User experience with ORchiD

Statement	0	1	2	3	4	5	Mean
I immediately understood what I needed to do	0	0	3	4	10	8	3.92
The application was easy to work with	0	0	4	3	11	7	3.84
I like the drag and drop feature	3	0	0	6	5	11	3.92
I was able to describe my resource in the first task	1	0	2	5	7	10	3.88
I was able to describe my resource in the second task	1	1	1	4	6	12	3.96
The optional fields were easy to comprehend	1	2	8	6	5	3	2.84
The tooltip feature was useful	7	0	3	6	7	2	2.48
In general, the application is simple	1	1	2	3	12	6	3.68

The user evaluations for the statements describing ORchiD suggest that most users thought that ORchiD was simple and easy to work with, as shown in Table 1. The Drag & Drop was liked by 16 users who agreed and strongly agreed with the statement. Some users also expressed this in their comments. On the other hand, the tooltip feature did not have similar success as most of the users either disagreed or skipped this statement and also expressed their dislike in the comments. When giving general feedback, users described the feature as taking too long and not always being helpful. In general, users did not have problems describing their resources using ORchiD.

4.2 Metadata Representation

Table 2 shows the levels of agreement that users had with various statements regarding ORchiD's representation of metadata.

Table 2. User view of ORchiD metadata representation

Statement	0	1	2	3	4	5	Mean
The fields are suitable to represent my resources	0	0	4	7	10	4	3.56
I expected other fields. Something is missing	1	2	7	7	6	2	2.84
More fields should be required, not just the title and description	0	2	4	2	13	4	3.52
In general, I am happy with the details presented for resource description	1	0	2	5	7	10	3.88

Both ORchiD and the repository conformed to the LOM specifications in representing all of the fields but it was obvious that LOM is a large metadata set and its comprehensiveness was not appreciated by most of the users. It was also highly scrutinized in the user comments even though most of the users were able to describe their resources. The user evaluations of LOM shown in Table 2 showed that the majority of users expected other fields; however, 17 of the users still said that they were happy with the details they were presented with. When providing general feedback, users clarified the difficulty that they had regarding the metadata standard, saying that it was difficult, too large and overwhelming.

4.3 Repository Representation

Table 3 shows the levels of agreement that users had regarding the way in which the data was represented when viewed from the EPrints Web interface.

As can be seen from Table 3, the majority of users agreed and strongly agreed with the statements regarding the way in which the data was represented

Table 3. Repository representation of resources

Statement	0	1	2	3	4	5	Mean
My items are represented correctly	3	0	1	4	7	10	3.68
The presentation of my items was as I expected	2	0	3	5	7	8	3.28
The information presented is easy to understand	2	1	2	5	7	8	3.52

in the EPrints repository after being deposited via ORchiD. This serves as an indication that the tool worked as one would expect and that it was compatible with EPrints.

4.4 Relative Difficulty

Table 4 shows how users ranked ORchiD in terms of its relative difficulty compared to other tools that they had used for depositing content into repositories.

Table 4. User percentages for general ORchiD difficulty

	1	2	3	4	5	
ORchiD is much harder	2	1	8	10	4	ORchiD is much easier

Based on the results in Table 4, it could be argued that ORchiD has simplified repository deposit with 40% and 16% of users agreeing and strongly agreeing that ORchiD is easier to use than other solutions.

4.5 General Comments

In addition to the answers users gave to the statements above, users also made general comments regarding ORchiD. For instance, users described the system as being: easy; simple; much less sophisticated than other interfaces; very usable; a good idea; and encouraging for users to upload content. On the negative side they commented that: there were too many optional fields; the fields were difficult to understand and overly complicated for general use; open licensing options were expected but not found; and that the value of the application was not always obvious. Furthermore, users also made suggestions on how to improve the system, such as: by making use of automatic metadata extraction techniques; using a broader metadata standard; and making more metadata fields required. Overall, however, the user survey showed that ORchiD simplified and streamlined the deposit process, though there is room for improvement, especially when it comes to the representation of metadata.

5 Conclusion

The reason that many repositories for OERs remain unpopulated is a multi-faceted problem. However, one of these reasons could be related to the need for simpler solutions for depositing OERs and solutions that are integrated into the content creation workflow. In order to investigate this, a desktop tool called ORchiD was built that simplifies the deposit process by allowing users to deposit content into repositories straight from their desktops. The tool made use of an EPrints repository that had been modified to accommodate complex OERs and that allowed for remote deposit via a SWORD interface. Evaluation of the tool showed that users generally had a good experience using it; however, there were some issues related to the representation of metadata though, in general, the majority of users were satisfied with the way in which they could describe their OERs. Furthermore, users were satisfied with the way in which their OERs were represented in the EPrints repository, when viewed via the standard EPrints Web interface. Overall, the feedback from users suggested that the tool was simpler to use than other tools that they were familiar with and could contribute towards simplifying and encouraging the deposit and sharing of OERs.

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