

Open Educational Resources and the Repository Network edu-sharing

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Abstract—Education providers increasingly integrate digital learning media into their education processes and thereby recognize the advantages of a sharing and reuse culture. But too many educational resources are still buried in closed content management systems, in local databases or on individual or institutional websites and are often not sustainably maintained. The Open Educational Resource (OER) movement aims to overcome such barriers. It has adopted a rather broad definition of OER including open courseware and content, software tools, and learning object repositories. This article argues that edu-sharing, a portal to a network of repositories for educational resource management provides a comprehensive and suitable infrastructure to support the open education movement, but also communities of practice that cannot freely publish their educational assets, e.g., due to license constraints or other regulatory barriers.

Keyword: *management of open educational resources; OER; learning tools; open courseware; open content; learning object repositories; edu-sharing*

I. THE CAMPUSCONTENT PROJECT

The repository network and portal edu-sharing is an outcome of the four-year research and development project, CampusContent (2009). The project has been funded between March 2005 and July 2009 by the Deutsche Forschungsgemeinschaft (DFG). It set out to conduct trans-disciplinary research in a team of computer science and pedagogy experts to:

a) Find answers to the following key research questions:

- How can the visibility and sustainability of digital learning resources be improved?
- How can a sharing and reuse culture for high quality content and pedagogical best practices be promoted and technically enabled across heterogeneous development and delivery systems?
- How can best pedagogical practices be smoothly conveyed to practitioners,

including lecturers, course developers, teacher or tutors?

- How can educational resources be designed and adapted to accommodate different application contexts?
- b) Support sharing, joint development and reuse of educational resources and pedagogical best practices, both through methodological and technical contributions.

The CampusContent Project was strongly inspired by design principles for component software including cohesion, de-coupling, parameterization, and late composition. If these ideas could be carried over to digital learning resources, there was a good chance that the success of component software would come here, too. Further, we observed that although a plethora of free educational resources exists, suitable candidate content is difficult to find and access because it is hidden on institutional or individual websites, buried in closed content management systems or in local learning management systems or because it lacks meaningful metadata. Even if a promising resource is discovered, important context information, such as the pedagogical context for which it was designed, ownership rights and rights of use, is not documented and thus are likely to prevent its proper reuse.

II. THE REPOSITORY NETWORK EDU-SHARING

As an academic project, CampusContent aimed at higher education initially and was inspired by our experiences with technology-enhanced distance education. In the course of the project, however, other educational institutions like schools and vocational education providers aspired to integrate the methods and technology developed

in CampusContent in their e-learning processes. Especially local and regional school networks that are committed to technology-enhanced learning at different types and ages of schooling raised a strong demand for content sharing technology. Due to the heterogeneous landscape of learning technology there was a need to accommodate a range of learning management systems and authoring tools. To take this wider use of project outcomes into account, the project launched the product version of its repository network under the name “*edu-sharing*” in August 2009.

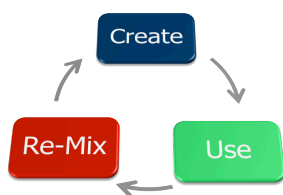


Figure 1. Circle of educational knowledge building and sharing (cf., Brown and Adler, 2008)

The vision behind *edu-sharing* was to initiate and foster a circle of educational knowledge building and sharing (Fig. 1) by:

- Supporting the development of reusable and sharable learning content and didactic scenarios (*create*).
- Encouraging teachers and lecturers to discover, review, critique and build on others' work (*use*).
- Enable teachers and lecturers to integrate others' work into their own teaching (*remix*).

Currently 9 didactic scenarios, which have been documented comprehensively in pedagogy- and methodology-oriented literature, are available in *edu-sharing* as scenario templates. Such templates describe learning arrangements in abstract form, i.e., without reference to topical content and specific implementations of communication and collaboration tools. The predefined scenario templates include: strategic problem solving, puzzle method, simulation, problem-oriented learning, project method, or case study. 31 templates for didactic interactions supplement the scenario templates. They include: *advocatus diaboli*, active structuring, flash light brainstorming and others.

To content authors and instructional designers, *edu-sharing* offers design methodologies, a range of authoring tools connected to the repository network, a search engine to discover content and predefined scenario templates in the repository network, and a personal workspace and a community portal for cooperative development.

Teachers and lecturers will primarily use their preferred learning management system (LMS) and the search engine to design executable courseware. A specialty of the LMSes integrated in *edu-sharing* is that they allow the search for content and scenarios from within the LMS. Suitable content can then be referenced in a course and appropriate scenarios can be imported and completed.

Students typically use their school's LMS. If this LMS is an integral part of *edu-sharing*, they may discover further valuable learning resources, such as open content and open courseware, in the repository network or in attached content pools with the help of the search engine.

A. Technology

The core technology is a distributed educational resource repository that is organized as a network of homogeneous repositories (cf. Fig. 2). Each *edu-sharing* node is typically operated autonomously by a separate institution, e.g., a communal computing center serving the schools in their region or a university computing center. This institution can decide whether it wants to run its *edu-sharing* repository as an isolated system or connect it with other repositories in the *edu-sharing* family. In the latter case the users can access content and codified learning arrangements, so-called didactic scenarios (cf. e.g. Krämer et al., 2010), from non-local repositories. They can also form cross-institutional communities of practice (like C_1 in Fig. 2), and give external users access to all open and selected closed resources.

Each node in the *edu-sharing* repository network comes with a local repository that is enriched by common community services and can be embedded in locally preferred learning environments and authoring tools for content production. The latter include an OpenOffice-based editor for SCORM-compatible courseware and an offline editor for QTI 2.0-compatible tests.

Each edu-sharing repository also includes a license management component that ensures that each resource in the repository has a rights-of-use license attached.

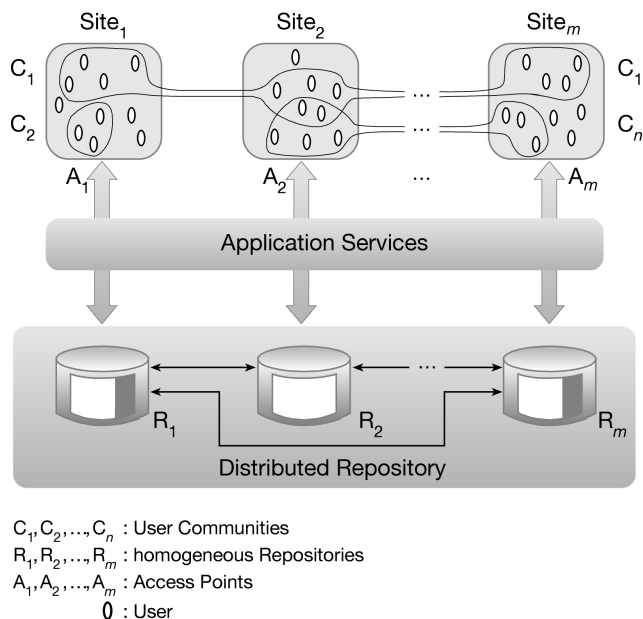


Figure 2. Networked repositories with cross-organizational communities

The edu-sharing system is free open source software, which can be downloaded from www.edu-sharing.net. The default distribution includes several authoring tools and learning management systems (Moodle, metacoon, OLAT).

B. Sharing and Reuse versus Open and Closed Content

As CampusContent started with the aim to support the open content movement, it supports Creative Commons licenses. But as we went on, we learned from potential users of edu-sharing that open content and Creative Commons licenses are not always the way to go. Schools, for instance, do not own much digital content. Rather, in their teaching they rely on content bought from educational publishers. In Germany, most likely also in other countries, this led to the situation that different school districts spent money for the same resources that they can only maintain in their local repository and deliver to schools in their district. The heterogeneity of learning management systems and a lack of sharing infrastructure prevents a more cost-effective collaboration here.

To cope with such situations, edu-sharing allows the sharing of resources across heterogeneous learning management and authoring systems. In addition, it provides open interfaces and a trusted interaction protocol. Both together allow the integration of proprietary content pools in such a way that their content can be discovered and used from within edu-sharing while obviating the necessity to maintain copies of such foreign content in the edu-sharing repository. Through the trusted interaction protocol, there is also no need to maintain user data and access rights in edu-sharing. Rather, access rights managed by school servers are directly forwarded to the foreign content pool. Finally, the license management component is extensible to serve other licenses than Creative Commons, as well.

C. Collaboration in Shared Workspaces

Besides providing open access to learning content and pedagogical scenario templates, edu-sharing further supports collaborative work processes in networked "communities of practice" (Lave and Wenger, 1991). For each registered user, the local edu-sharing repository provides a personal workspace. Thus, edu-sharing users can manage their own, licensed and discovered open content in collections, which are represented as folders in the workspace and are maintained in the repository. All resources in the workspace only exist once and are just referenced in collections, not copied.

In their personal workspace, educators may simply want to work on their own, first. However, once resources are uploaded into or created within the edu-sharing system, sharing resources with other users or groups is effortless. Particularly for the bootstrapping process of communities of practice, this strategy is promising. Educators can invite trusted peers to access individual resources, selected collections or the whole workspace in read or write mode.

III. OPEN EDUCATIONAL RESOURCES (OER)

From our sketch of the motivation behind the CampusContent Project it should be obvious that it shares the ideas of open educational resources and advances its wider definition of this concept, which includes (OECD, 2007):

- *content* of varying granularity;
- open source software *tools* for developing, discovering, using, adapting, remixing, organizing and delivering learning content and learning arrangements and functionality for organizing communities of practice;
- *implementation resources* supporting interoperability and the design of sharable content and best practices.

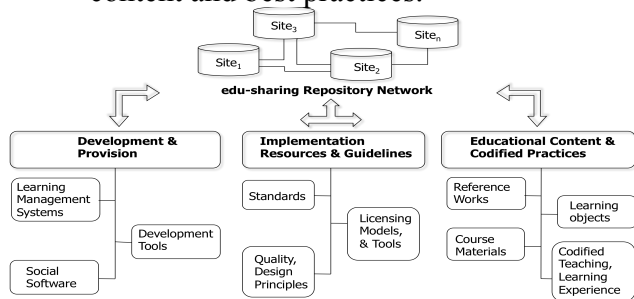


Figure 3. Conceptual map of OER (following OECD, 2007, p. 31)

The conceptual map of OER on Page 31 of the OECD study (2007) inspired the mapping of the CampusContent Project’s contributions onto the open educational resources domain (Atkins et al., 2007) as illustrated in Fig. 3.

IV. CONTRIBUTIONS OF EDU-SHARING TO OER

The following discussion is organized along the three components of OER: content, software and implementation resources (OECD, 2007, p. 31)

A. Content

In edu-sharing educational resources of different kinds can be managed: digital media assets including text, illustrations, simulation, video and audio clips, photos, maps, or quizzes; learning objects, which combine topical content, a learning objective and learning activities (Krämer and Han, 2009); courses and course components (Krämer and Klebl 2009); teaching and learning experiences in the form of didactic scenarios (Krämer et al., 2010), and reference works like glossaries or thesauri.

Figure 4 is a screen shot of a section of a course on German postwar history. The course references media assets from within the repository network, such as historical speeches of German and international politicians, facsimile of contemporary newspaper articles and historical

documents, and short historical videos related to the establishment of the Berlin Wall (see, Fig. 5).

B. Software Tools

Concerning *development and provisioning software*, edu-sharing comes with a range of end-user tools for creating media assets, authoring courses based on resources and scenario templates found in the repository network or personal workspaces, editing didactic scenarios, or creating QTI-compatible questions and test. The default distribution includes popular open source learning management systems (LMSes) that are interfaced in such a way that learning resources and didactic scenario templates can be linked into a Moodle. Conversely, resources stored in the LMS can be uploaded in the repository or personal workspace.

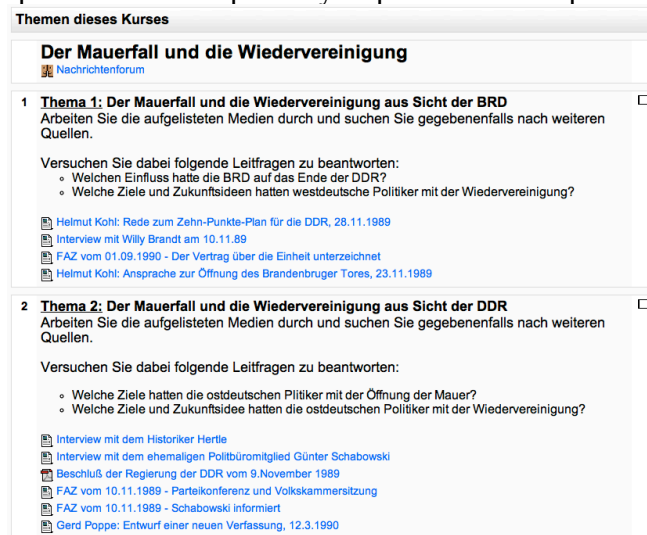


Figure 4. Section of a history course in Moodle referencing edu-sharing objects (in German)

Through edu-sharing’s rendering service, repository content can be played in all attached LMSes. It uses special modules for reproducing a range of graphics, sound and video files, QTI-compliant tests and exercises, SCORM, Moodle and metacoon courses. Resources hosted on closed publisher servers play their content on the own server on behalf of the customer’s distant LMS-systems.

Currently, social software is realized in edu-sharing in the form of a community portal, with community building and information services. A rudimentary user tracking service collecting dynamic metadata such as the numbers and

contexts of use of resources is also available. Additional community functions like resource rating, user tagging and annotation of resources are under development.

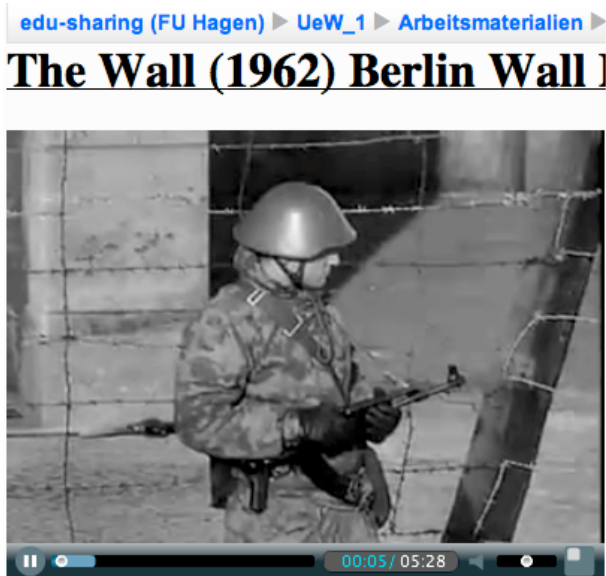


Figure 5. Movie documenting the building of the Berlin Wall

C. Implementation Resources

The edu-sharing license manager acts like an agent that becomes visible whenever a new resource is uploaded or rights of use are inspected by re-users. Thus our license manager tackles the lack of awareness of copyright issues, which Hylén (2006) considered a challenge for OER.

Best practices are supported from three perspectives:

Didactic scenarios capture best practices in learning design (Klebl et al., 2010). They describe arrangements of learning, teaching and tutoring activities and pedagogical interactions. The didactics group of the CampusContent team has codified widely accepted didactic scenarios in the form of content-free *didactic scenario templates* and made them available in edu-sharing. The learning scenario editor of edu-sharing allows users to edit such templates by adding appropriate learning resources and tool bindings (e.g., wiki, forum, newsgroups, etc.) and refining or modifying predefined learner and tutor activities. Educators can also define their own scenarios and publish them with or without content in the repository.

Configurable and pedagogically parameterized objects implement design principles that were carried over from software engineering and aim at improved reusability and effectiveness in content production (Krämer and Han, 2009). Configurable objects are interactive information or learning objects that can be applied in different topic areas. They are equipped with “leveling-screws” through which they can be adapted to the actual application context.

Design principles, guidelines, help wikis, and useful information about various e-learning topics are collected and summarized in a comprehensive *information portal*. The categories addressed include: e-learning software and tools, best practices in e-learning content production, didactic scenarios, legal issues and other topics. This information portal is jointly developed with DINI (Deutsche Initiative für Netzwerkinformation e.V.).

A third element in the implementation resources branch of the OER concept map copes with interoperability issues, in general, and standards as the IEEE, IMS and other standardization bodies advance them, in particular. We already argued that edu-sharing supports major e-learning standards including the OAI metadata harvesting protocol, web service standards and open interfaces. This will allow us to expand the homogeneous edu-sharing repository network to a heterogeneous network, which will provide access to foreign repositories.

D. Sustaining Learning Resource Projects

With its repository network and personal workspace concept, edu-sharing supports both a user-producer and a co-production model of (open) educational resources (cf., OER, 2007, p. 13, 14). Through the coupling of different repositories and the embedding of heterogeneous learning management systems, learning resources will become “searchable across repositories” and can be “integrated and adapted across platforms”.

E. Internationalization and Localization

Specific challenges of OER in a global setting are issues like internationalization and localization. For large bodies of text, there is currently no other way than translation. If the text

is represented in a specific format like Connexions courses are, appropriate editors should allow translators to keep layout and structural information, if suitable, and just change the language of the text.

For interactive resources including movies, animations, user interaction, graphics and the like we have started to develop design patterns and structure templates that pull all language-and notation-dependent features to the interface such that they can be reconfigured. For instance, technically, inscriptions in graphics or animations can be modeled by variables in the code and bound to specific strings in a particular language at configuration time. Audio explanations of animations should be chopped into segments that are assigned to the appropriate synchronization points in the visual animation. If these synchronization points are visible at the object interface and the audio segments can be cut out, corresponding audio segments in the new language can be resynchronized with the visual animation.

V. CONCLUSIONS

Although close in spirit to the OER idea, CampusContent was not designed as an OER project. Rather it set out to design and construct a portal and distributed repository infrastructure that supports educators in sharing, joint development and reuse of learning resources and best pedagogical practices even if they prefer different end-user systems including content authoring tools, learning management systems and collaboration and communication services.

In the end, as we argued in the main body of this paper, the project's contributions address OER needs to a great extent. Our discussion emphasized technological concerns such as storage, management, retrieval, adaption, remix and delivery of educational content and codified best practices.

With the new version of edu-sharing to be released in October 2010, the user interface is fully accessible at the cost of double development.

As edu-sharing has been launched only a short while ago, however, current weaknesses include a lack of a critical mass of learning resources and a

relatively small user community. The sustainability of edu-sharing outcomes, the growth of its content base and its community are not ensured yet, as for other repository and OER projects.

We have also not yet decided about a suitable *quality assessment process* for open and closed content. Our initial idea was to leave the organization of such processes to upcoming communities of practice to avoid the bottleneck of peer reviews or an editorial committee.

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