A MODEL FOR OPEN CONTENT COMMUNITIES TO SUPPORT EFFECTIVE LEARNING AND TEACHING

Kwok-Bun Yue, Toneluh A. Yang, Wei Ding
University of Houston-Clear Lake
2700 Bay Area Boulevard, Houston, TX 77058, USA
{yue|yang|ding}@cl.uh.edu

Ping Chen
University of Houston-Downtown
One Main Street, Houston, TX 77002, USA
chenp@uhd.edu

ABSTRACT

Open Source Software (OSS) has provided a successful model for community-based collaborative development of software. The success of OSS has triggered interests in applying similar approaches to other areas besides software development, such as open courseware development and open content projects. However, there are nearly no projects on building highly collaborative Open Content Community (OCC) for developing high quality, comprehensive, rich and freely distributable educational materials on specific subjects. Learners can directly use these educational materials to effectively learn the respective subjects, and instructors can use them to construct courses. This paper presents an OSS-based model for building an OCC that supports volunteers to effectively develop, evaluate and use open content educational materials. The model is composed of fine-grained knowledge units to encourage high degree of collaboration. It also has a hierarchical module-based framework for structuring projects. The community Website provides tools and services for content development, project management and project navigation. It is designed to provide high flexibility to cater to varying requirements of different projects, which may evolve in a way similar to OSS projects. An initial prototype has been developed and the authors are in the process of fine-tuning the prototype for experimentation with sample projects.

KEYWORDS

Open source, open content community, learning, teaching, Web community, courseware.

1. INTRODUCTION

The advance of the Web has significantly and rapidly changed the way of learning and teaching. For most subjects, the Web is a vast repository of relevant resources for learners to learn various subjects and for instructors to extract course-related materials. However, these resources are usually scattered, unstructured and of inconsistent quality. Many also have copyright issues prohibiting their adoption by instructors as courseware materials. A central repository of high-quality, comprehensive, rich, and freely distributable educational materials is obviously very beneficial for both learning and teaching.

We have identified four criteria for effectively using the educational materials for learning and teaching:

(1) High quality: The Web is full of information that is incorrect, outdated, misleading, of low value, or poorly presented. Although it is generally easy to find many relevant resources on a topic through search engines, tedious effort to sift through the voluminous resources has become a major inhibitor.

(2) Comprehensive: The educational materials should have a good coverage of all major subtopics of a given subject, which can then be customarily selected to satisfy different learning and teaching scenarios.

(3)   Rich: Learners have different strategies, approaches, and capabilities for learning that are a function of prior experience and heredity (American Psychological Association, 1997). Only a rich collection of educational materials can effectively support a large community of diverse learners and teachers.

(4)   Freely distributable: Learners and teachers can then freely use them without any copyright concerns. More importantly, they can be modified for further improvement and customization, and then redistributed to benefit more people. This calls for an open copyright license similar to those used by OSS or open content projects.

The Open Source Software (OSS) model is a good candidate to be adapted to satisfy these criteria. The leading OSS Website, sourceforge.net (Sourceforge, 2003), is a vibrant community with more than 750,000 registered users and hosts more than 70,000 projects. This paper describes our effort of adapting the OSS model to an Open Content Community (OCC) model. The OCC supports projects to develop educational materials satisfying these criteria. Related work is discussed in Section 2. The model is elaborated in Section 3. Examples of how the OCC may be used are discussed in Section 4. We draw our conclusions in section 5.

2. RELATED WORK

There are several ongoing *open content* projects for developing freely distributed contents, such as *Wikipedia*, an open content encyclopedia (Wikipedia 2003). The two major projects focusing on developing and hosting courseware are the MIT *OpenCourseWare* (MIT OpenCourseWare, 2003) and Rice's *Connexions* project (Rice, 2003).

The highly successful MIT *OpenCourseWare* is perhaps the most visible project in open courseware development. It will eventually provide the public open access to all MIT courses and has triggered much discussion in higher education, including the advantage of an open courseware model (Newmarch, 2001) and comparisons with the OSS model (Baldi, 2002). However, it does not attempt to create a collaborative community for content development. Contents are developed solely by MIT faculty for MIT courses.

The current major project in building a community for developing open courseware is Rice's successful *Connexions* project. Content developers can develop modules using a set of predefined tools in the site. Modules are stored in custom designed XML documents and they can be selected to construct courses.

Both *Connexions* and MIT *OpenCourseWare* focus on the development and hosting of courseware, where standards promoting courseware interoperability, such as *Open Knowledge Initiative* (OKI, 2003) and *Shared Content Object Reference Model Initiative* (SCORM, 2003), are important. Their direct targets are thus instructors for hosting courseware for their students. In contrast, our goal is to allow both learners and instructors to use the educational materials directly.

The OSS model has been extensively studied (for example, Raymond, 2000; O'Reilly, 1999). An important observation is that an active community of highly collaborating users and developers are very beneficial to OSS projects by improving both quality and richness. An OSS community Website such as *sourceforge.net* provides the necessary supporting tools and utilities for developing and promoting projects. Project maintenance and development decisions are entirely decided by the project workgroup, which is composed of domain experts who are motivated to see the projects to be successful. The cost of entry for starting a project is kept very low so a large number of projects can be hatched. These projects will then undergo natural evolution within the OSS community site and the fittest survives and prospers.

In *Connexions*, content developers must use the site's tools to develop contents in its XML format for the entire modules. It is not possible, for example, for someone who has an excellent case study in a subject in Microsoft's Word format to simply submit the file and make it open for everybody. Furthermore, content richness is limited by the sizes and natures of modules, which mostly resemble lecture notes. Finally, there is also a lack of structures to plan for modules to provide good coverage of a given topic. In the next section, we present a model to address these problems.

3. THE PROPOSED MODEL

Figure 1 is a UML diagram illustrating the high level architecture of the proposed model. *Modules* are recursive. They allow a project workgroup to flexibly define the structures of the project. Actual contents are stored in *knowledge units* (*KU*). Examples of KUs are lecture notes, objectives, examples, case studies, project assignments, exercises, collected resources, glossary, supporting software, etc. Note that KUs are independent of modules and may be included in many modules. *Courses* can be constructed by selecting modules and KUs. However, the community site is not primarily for hosting courseware, but for collecting educational materials people can freely use. Thus, constructing courses is only one example of how one may use the modules and KUs.
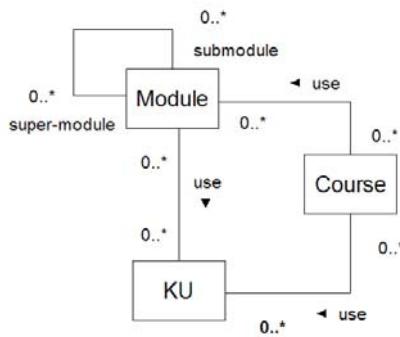

Figure 1 High-level UML architecture

This fine-grained approach lowers the cost for contributing to projects. Instead of developing an entire module, one can submit individual KUs that they may have already developed. Furthermore, a module may now refer to multiple KUs and learners may select the ones that best fit their approaches and capabilities.

The model proposes to build an OCC site for fostering project development. Volunteers can form *workgroups* to develop educational materials on a particular topic. They can then invite volunteers to contribute to the project. The site provides features similar to sourceforge.net, such as version controls, feature (sub-modules and KUs) requests, bug fix (content correction) requests, search tools to find the right projects, promoting tools (e.g., most active and top visited projects), etc. The site also contains features unique to open content development of educational materials, including tools for declaring module architecture and managing volunteers, optional editors for editing modules and KUs, etc. Perhaps the most important one to ensure quality is to provide pre-publication and post-publication reviews. Post-publication reviews are done through community-based feedback. Workgroups can also select from a range of pre-publication review tools for the best mechanism for reviewing contents before publication in the site. The details of these features are beyond the scope of this paper and will be discussed in a future paper.

4. USES OF THE COMMUNITY

Our ultimate goal is to build an OCC site comparable to sourceforge.net with a vibrant community of collaborating content developers and users, encompassing thousands of projects. Such an OCC site will be very useful in many different ways and thus has the potential of attracting a large number of users with diverse needs. A large community will in turn foster rapid project development. We present several scenarios for using the community below.

Learners can start by using the rich collection of modules and KUs that best fit their own capabilities and strategies. A known way of effective learning is by active participation. Thus, learners can develop KUs such as examples, case studies, guidelines on using KUs (which are KU themselves), etc. Communicating with the project workgroups, who are usually domain experts, on fine-tuning their contributions, can further

benefit the learners. If a sub-topic is missing, they can request a sub-module, so development and learning can be more customized. They can also participate in community-based post-publication reviews and discussions to benefit from the collective wisdom of the community.

Because the educational materials will have an open copyright based on *Creative Commons* licenses (Creative Commons, 2003), with proper attribution, instructors can simply cut and paste whatever they want in order to custom built their own courseware. They can also contribute or use project assignments in the site. Furthermore, they can require students to contribute to a given project and use community feedback as part of the grading of the student work. Alternately, the students can be asked to participate in post publication review, or to actually form workgroups to develop projects. After all, the best way to learn is to actively develop.

5. CONCLUSION

This paper briefly describes a model for constructing a highly collaborative OCC for developing high quality, comprehensive, rich and free distributable educational materials. Because of space, many technical details have been omitted here. They will be discussed in longer papers in the future. An initial prototype has been implemented to support the model architecture, as well as tools for collaborative development, such as version control. The prototype is under refinement to incorporate more supporting features including pre-publication review tools. We have contacted educators from other universities to develop joint projects when the prototype is ready, and we will report the results in the future.

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