

Open Cooperative Design in Studio Courses: The Challenges for Online Collaboration

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ABSTRACT

What is the role of collaborative tools in the context of open source engineering design innovation? In this paper, I describe *ThinkCycle*, an online platform that supports open collaborative design towards sustainable products. It has been used in the context of studio design courses taught at MIT. Usage patterns show several forms of intermittent online interaction but a lower level of content postings.

Early results from an ongoing study suggest that while students find the online tools useful for sharing, documenting and problem solving, many perceive them as complex and an added overhead in the design process. To be more useful such collaborative systems must facilitate *asynchronous lightweight* interaction using existing modes of communication and design. Peer-review by external stakeholders and domain experts, not co-located with design teams, provide incentives for online collaboration.

KEYWORDS

Collaborative design, learning, evaluation, social attitudes

INTRODUCTION

Solving critical real-world challenges in the environment and underserved communities requires globally distributed expertise from individuals, organizations and communities. How does one facilitate distributed cooperation towards sustainable design in such critical problem domains? What is the role of online collaboration tools in studio design courses to support open source engineering innovation?

Eric Raymond notes trends in the open source software movement¹ that suggest benefits from distributed expertise and an “open” evolution of design based on public peer-review and contributions [1]. With this view, I developed *ThinkCycle*² as a publicly accessible online platform for distributed collaboration in engineering design. Since May 2001, over 1500 users in several universities and organizations worldwide have used it to browse, critique and contribute hundreds of design resources in over 40 topic domains. However, it has been more challenging to engage students in studio courses to use the system for actively collaborating on design projects online.

¹ <http://www.tuxedo.org/~esr/writings/cathedral-bazaar/>

² <http://www.thinkcycle.org>

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CONFLICTS IN COOPERATION VS. LEARNING?

Studio design courses have an important role to play in developing a culture of sustainable design innovation in university settings. Over the last 2 years, along with other graduate students and faculty at MIT, I have been involved in creation and teaching of an experimental design studio, *Design that Matters*³. Student teams designed working prototypes for real-world challenges, guided by domain experts and stakeholders. The studio was run for the 2nd time this year (spring 2002), in conjunction with several similar studios at universities worldwide. Few studies of learning in online collaboration environments have been conducted in the past; most point to many challenges in the adoption and use of online tools in course settings.

*CoWeb*⁴ is a collaborative learning environment used in courses at Georgia Tech [2]; conceptually based on *Wiki*, it was developed as a simple tool for creation of editable webpages. Users have equal access to change content while versions of all webpages are saved. The tool was more readily adopted in English composition and architecture studios, while there was “active resistance” in engineering and science courses. Interviews showed students unwilling to collaborate to retain better grades and many often perceived “only one correct answer” to problems. The researchers believe that in such highly competitive courses, students found it only “rational not to collaborate”. They suggest that rather than improving technology, there needs to be better support and incentives for group collaboration.

THINKCYCLE: OPEN COLLABORATIVE DESIGN

The *ThinkCycle* online collaboration platform was developed using an open source framework based on the *ArsDigita Community System*. It consists of services and modules for managing content, versioning, permissions, user membership, messaging, session tracking, and user-interface components. Custom applications for *ThinkCycle* are developed in the *Tcl* programming language with SQL queries, as packages running on an Oracle database for creating shared project spaces, posting content, uploading files, discussions, peer-reviews, tracking user history and a custom search engine. Any content posted can be set to private access for selected team members only. All content

³ <http://www.thinkcycle.org/dtm>

⁴ <http://cweb.cc.gatech.edu/csl>

on ThinkCycle is regularly archived on distributed mirror sites. This infrastructure provides a robust and scaleable online platform for a large distributed community. Related online systems include *SourceForge*⁵, which hosts open source software projects, and *Development Gateway*⁶, a community site for international development projects.

EVALUATION STUDY: MIT DESIGN STUDIOS 2001/2002

A part of my doctoral work, I initiated a three-part study that assesses the nature of cooperative design, learning outcomes and social attitudes towards “open design”, using surveys, intensive interviews and case studies of design projects. The pilot study was conducted primarily at MIT in summer 2002 and will be extended to participants in a studio course taught in Bangalore, India. An online survey was setup with 80 open-ended and multiple-choice questions (using a *Likert* scale). It was completed by 17 students in the 2001 and 2002 studios at MIT. Preliminary results from the online survey provide a partial qualitative assessment, which were further probed in the interviews.

Attitudes towards Collaboration: In the survey 71% of the respondents disagreed that they preferred to work independently, while all indicated they found working with others more helpful. 94% also indicated that they found their last group experience enjoyable and worthwhile.

Barriers to Open Sharing: 42% of the respondents viewed the field of their design project as intensely competitive, while only 12% attributed that to the course. 24% felt it took too much effort to share openly and a similar number said their ideas were too premature. Finally, only 12% felt others could use their ideas without benefit to them. Some students perceived external competition for projects with impact in the real-world, however no single social factor prevented them from openly sharing among classmates.

Modes of Online Access: Most respondents considered themselves proficient with the Internet and had fast access. All browsed the web and checked email several times a day, while some occasionally used online chat (47%). Clearly lack of access was not a factor impeding online usage. But most had little prior experience with online collaboration tools. Hence, the notion of online collaboration itself may be considered novel for many of the engineering students.

Experience using ThinkCycle: All respondents indicated having used ThinkCycle during the course. 59% visited the site at least several times a week and 82% considered it a useful online tool. The survey responses suggest four ways in which it was used and perceived: 1) *a shared group space* for exchanging designs among teammates, 2) *an evolving project repository* for documenting and accessing project history, 3) *a problem solvers area* for finding and solving design challenges and 4) *an open social space* for being aware of others work and seeking peer-review.

However, the frequency of postings was much lower than expected (only 31% posted content several times a week). In terms of general usability, 53% found it complicated and confusing and 30% found it very time-consuming.

What prevented regular content postings?

1. Lack of time in a busy semester. (cited by 50%)
2. Physical proximity of teammates and domain experts minimized perceived need for online exchange. (18%)
3. Lack of people actively monitoring projects online gave less incentive for users to post content. (12%)
4. Overhead of posting content perceived as an added commitment rather than part of design process. (12%)

In addition to improved navigation, many users requested tools for asynchronous content updates (24%) through email as well as real-time chat and shared drawing (35%).

SUPPORTING DESIGN AS SOCIAL PROCESS

Much of the design activity of engineering students is typically hands-on and face-to-face. Given time constraints and overhead involved, many of the participants in the studio were not naturally inclined to use online tools actively throughout the design process. Regular peer review by external stakeholders and domain experts (not co-located with designers) provides more meaningful social incentives.

The study suggests that participants view design as a *social process* rather than that of only archiving and exchanging data. The regular modes of communication such as email and chat can play a vital role as *secondary channels for sharing ongoing designs*, in conjunction with web-based collaborative tools. A study of Zephyr [3], a simple distributed chat system at MIT, indicates the role of “lightweight background attending” and the social reinforcement of visible expertise, for sustaining ongoing activity among users. Asynchronous tools could allow users to stay abreast of relevant content postings and upload sketched designs more regularly. This ongoing study suggests the role of open peer-review and asynchronous lightweight interfaces using existing communication modes, to better promote sustained online collaborative design.

ACKNOWLEDGMENTS

Thanks to the instructors of the Design that Matters studio and students who participated in the ongoing study at MIT.

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⁵ <http://www.sourceforge.net>

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