Thesis Study: Collaborative Design and Learning in Studio Courses
Phase I: Summary of Online Survey Conducted at MIT

Nitin Sawhney
PhD Candidate, MIT Media Laboratory
nitin@media.mit.edu

Abstract

How does one facilitate distributed cooperation towards sustainable design in critical domains? What is the role of online collaboration tools, studio design courses in universities and open source hardware design towards sustainable innovation?

As part of my thesis work, I developed an online collaboration platform and co-taught studio courses focusing on sustainable design at MIT. To examine the nature of collaborative design, learning outcomes and social attitudes of students participating in such studio courses, I have initiated a study consisting of online surveys, intensive interviews and case studies of design projects. In this paper, I summarize the results from the online survey conducted at MIT in May/June 2002.

The survey was completed by 17 students who participated in the Spring 2001/2002 studio courses at MIT. The survey responses provide a preliminary and qualitative assessment of student attitudes towards learning and collaboration in this setting. The responses suggest a number of key themes for studio courses: 1) courses focusing on sustainable design through hands-on learning have a broad appeal among students, 2) an important element of such real-world design courses is establishing meaningful linkages with external domain experts and organizations, and providing students opportunities for fieldwork, 3) the success of such courses requires commitment from faculty to provide academic legitimacy and active involvement of instructors and domain experts in mentoring group projects.

For online collaboration platforms, the responses indicate: 1) online tools focusing on sustainable design are useful for sharing and archiving designs, and have a role in dissemination and problem solving however they are most valuable when teams or domain experts are not always co-located, 2) the overhead for usage by busy engineering students must be minimized by simplified interfaces and greater integration with existing channels of communication like email, 3) in addition to improved navigation, many users requested tools for asynchronous content updates and real-time chat. Overall responses suggest that users view design as a social process rather than only that of archiving and exchanging data.

The next phase of the study will focus on design process, external linkages and intellectual property issues via intensive interviews of participants at MIT. In addition, a study will be conducted with participants in a similar studio course in Bangalore, India.
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MIT COHUES INFORMED CONSENT FORM
1. Introduction

Solving critical real-world challenges in the environment and underserved communities requires distributed expertise from individuals, organizations and communities in diverse institutions and localized settings. How does one facilitate distributed cooperation towards sustainable design in such critical domains? What is the role of online collaboration tools, studio design courses in universities and open source hardware design innovation?

Recent trends in the “open source” software movement suggest many benefits can be derived from sharing design knowledge, and allowing an “open” evolution of design based on public peer-review and contributions from diverse participants for rapid design iteration. With this view I developed ThinkCycle, an online platform that provides an environment for Open Collaborative Design in critical domains. Hundreds of individuals in universities and organizations worldwide have browsed and contributed design resources in nearly 40 critical topic domains on ThinkCycle. However, one needs to carefully examine the nature of social incentives for participation and design of the online tools to ensure that such collaborative platforms remain effective.

It has become clear that simply building a distributed software platform does not by itself create a culture of design innovation in such problem domains. Studio design courses in university settings have an important role to play. However, such courses require a multidisciplinary approach to learning and cooperative design. 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”. As part of this course and for my doctoral work, I have been developing an online collaboration platform, ThinkCycle. The studio course is being run for the 2nd time this year (spring 2002), in conjunction with several similar studio courses at universities worldwide. Few studies of such learning and collaboration experiments have been conducted in the past. Most experiments point to great challenges in the adoption and use of online tools in such settings for a variety of reasons.

I have initiated a three-part study that assesses the nature of collaborative design, learning outcomes and social attitudes of students, external participants and instructors towards cooperative initiatives, using online usage, questionnaires and interviews. The pilot study is being conducted primarily at MIT in May-July 2002 and will be extended to participants in the studio course taught in Bangalore, based on preliminary results and refined methods. The study consists of online surveys, interviews, and case studies of design projects. This paper reports on the first stage of the study involving the online survey. The summary of survey responses provides a partial qualitative assessment and preliminary understanding of key issues in learning and collaboration that will be further probed in the intensive interviews.

1.1 Goals of Online Survey

For the online survey there are two main objectives:

A. Examine Nature of Collaborative Design Projects in Classroom Studio Courses
   I. Background and prior experience/inclination towards collaborative design.
   II. Process, artifacts, tools and procedures used in ongoing design activity.
   III. How did they research, document, and negotiate design constraints?
   IV. How was peer-review solicited and influence design outcomes?
   V. Concerns about intellectual property, privacy or disclosure of design.

   Key Parameter of Interest: Social Process of cooperative design and incentives for open disclosure and review?

B. Examine Online Participation and Design Activity on ThinkCycle Platform
   I. Prior familiarity, access and experience with online interaction.
   II. Incentives to post content online, regularity and nature of postings.
III. How did online posting and peer-review influence design process/outcomes?
IV. Barriers and constraints experienced that limited online interaction.
V. Tradeoffs in the mapping of natural design activity to online interaction.

Key Parameter of Interest: Why do we see a low level of adoption and online activity by participants in collaborative design projects? What are the barriers involved?

Note: all assumptions and outcomes are based on a small group of design projects in a university setting and the use of an experimental online collaboration platform.

1.2 Methodology for Online Survey

The online survey consists of a questionnaire to solicit self-reported background, motivations and experiences in the design studio and online platform. The survey uses a mix of multiple-choice questions and open-ended questions. For many multiple-choice questions a Likert scale was used to provide a series of statements to which participants can indicate degrees of agreement or disagreement. The survey consists of 80 questions categorized into 5 sections: 1) demographic information, 2) general attitudes towards collaboration in courses, 3) evaluation of studio design courses, 4) online access and experience and 5) experience and usage of ThinkCycle.

The survey and interview protocols were submitted to the MIT Committee on the Use of Humans as Experimental Subjects (COUHES), in accordance with the following guidelines:

“Questionnaires distributed and interviews conducted for research purposes are subject to COUHES review. Questionnaires must state at the beginning that answering is voluntary and that there is no obligation to answer every question. There must also be a statement about confidentiality and anonymity. Interviewers must assure their subjects of the same rights and the right to discontinue the interview at any time.”

The COUHES committee met on May 16th and reviewed the study proposal. The survey was revised to incorporate their suggestions, and was subsequently approved by the committee.

A survey questionnaire generation, administration and reporting system has been deployed on ThinkCycle. I have developed a comprehensive survey tool that allows investigators to setup online surveys with questions having multiple response options. All user responses are stored in the Oracle database in a secure manner. Cumulative survey results are automatically generated and displayed using graphs and anonymous text summaries.

The survey was pilot tested with one participant and refined before making it available to all other participants at MIT. All participants signed an informed consent form and most completed the survey in 30-45 minutes. All responses are anonymous and cumulative results automatically generated online are only released to participants who have already completed the survey.

1 http://web.mit.edu/committees/couhes/consent.htm
2. Summary of Survey Responses
The following is a summary of responses from the online survey administered to students that attended the MIT studio design courses in 2001 and 2002. The summary is categorized into 5 sections (along the lines of the survey), with key survey results outlined and some preliminary interpretations of these results.

2.1 Demographic Information
Summarized results from the first section of the survey indicate:

- **Response Rate:** The online survey was completed by 17 respondents out of 18 participants solicited from the MIT DtM studio courses in 2001 and 2002 (94% response rate). Despite 80 questions asked in the survey (multiple-choice and open ended), there was a completion rate of 97-100%.

- **Demographics:** Of the 17 participants roughly 70% were male and 30% female with an average age of 28 years (standard deviation of 10). The participants were equally split among undergraduate, graduate and PhD candidates (nearly a third each) with a small number of alumni attending (2 respondents). See figure 1.

- **Background:** Almost all respondents were MIT students and had technical backgrounds. Degree majors included a diverse mix of engineering fields (Mechanical, Chemical, Aeronautics, Biomedical and Oceanographic) along with some students from the Media Lab and one in humanities (English and Business from Harvard).

![Participant Demographics](image)

**Figure 1.** Participant Demographics

**Diverse but Typical Student Mix:** The overall demographics provide a range of respondents among undergraduate and graduate students with diverse technical backgrounds across MIT. The age and gender of respondents also suggests a fairly typical distribution found in advanced MIT courses.

**Broad Course Appeal:** The demographics of participants observed suggests that the studio course has appeal to a broad mix of engineering students throughout the university, rather than in any one discipline alone. This indicates that there would be student interest for such a course, offered institute-wide and/or incorporated in many engineering curricula.

**Small Class Size:** One may consider the students participating in the studio courses each year (9-12) to be a low number relative to standard MIT courses – this can be assumed to be either due to lack of publicity, novelty of the subject, lack of legitimacy (due to unofficial status of course) or lack of perceived integration into existing engineering curricula. On the other hand, the number of students participating each year may be considered entirely appropriate for a studio design course (offered for optional credit) not unlike seminar or special topics electives offered at MIT. However, there are indications (discussed later) that many more students would have participated if they had known about the studio course well ahead of time.

**Survey Response:** The high survey response rate and completion rate suggests enthusiasm to participate in the study. One student from the 2001 course reviewed the survey questions but declined to participate, despite my insistence. He explained that he felt a lack of confidence that his project and learning experience was successful enough to report in the survey.

**Note on Survey Response:** Overall, one must recognize that the total number of respondents available for this survey does not by any means provide a representative and statistically significant sample for rigorous quantitative analysis. Hence, the results gleaned from respondents in this survey (within the context of a small studio course offered at MIT) must be interpreted qualitatively to suggest potential behaviors and hypothesis for future studies on a larger number of courses and participants. These summary results are also useful for posing relevant questions in follow-up interviews with some of these participants, to better understand individual behavioral attitudes and motivations.
2.2 General Attitudes towards Collaboration in Courses

In this section of the survey, general attitudes towards collaboration were solicited before asking more specific questions in the context of the actual design studio and usage of ThinkCycle. The responses indicate a number of general attitudes (based on cumulative results):

**Individual vs. Group Work:** Questions 1 and 2 were set up to disambiguate preference vs. benefit of working in groups. It was expected that some students would consider group work beneficial, yet prefer to work alone for various reasons. In the survey 71% of the respondents disagreed that they preferred to work independently, while 100% indicated they found working with others more helpful. 94% also indicated that they found their last group experience enjoyable and worthwhile.

The high rate of positive attitudes towards the notion of group work (or collaboration) is not necessarily surprising, but serves as a notable point as we examine the level and nature of online interaction, sharing and peer review that one might expect to see among these students using ThinkCycle.

**Perceived Barriers for Open Sharing of Design:** The survey examined three specific perceived barriers to sharing – competition, maturity of ideas, and effort involved.

**Role of Competition:** Question 4 was used to determine if perhaps the perceived competitive nature of a field might induce lower incentive among students to collaborate or share evolving designs openly (within and outside the class). 42% of the respondents viewed the field of their design project as intensely competitive.

One must note that most students did not take the course for credit; hence there would have been little academic competition to receive better grades. Later in the survey, only 12% felt the course to be intensely competitive among students taking it. However, as the projects may have impact in real-world settings, some students may perceive a level of external competition. Question 5.A. also solicits a response to whether students may not share openly due to such competition. However, only 12% of the respondents were concerned that they would not share project designs openly because others may use their ideas without benefit to them.

**Maturity of ideas and effort involved:** It was expected that many respondents would feel uncomfortable sharing premature ideas, however only 24% perceived this as a barrier. Similarly only 24% felt it took too much effort to share project designs openly. Overall it seems that 76-88% felt that none of these three factors prohibited them from openly sharing their project designs.

Hence we need to carefully understand why the respondents later do not actively seem to share their designs online at a level that one would expect.
2.3 Evaluation of Studio Design Course

In this section participants were asked to reflect on their experiences with the studio design course they took at MIT. The section consisted of 24 multiple-choice and 4 open-ended questions. Of the respondents 41% took the course in 2001, where as 59% attended the 2002 course.

Why students took the Design that Matters Studio Course? 4 main reasons cited:
- Exposure to real-world problems and globally relevant social/developmental issues.
- Opportunity to work on practical design projects and learning by doing.
- Access to technical resources, a simulating environment and learning with peers.
- Lack of similar design studios in their own curricula or means to address social concerns.

General Evaluation of Course

Regarding the outcomes of the course, 71% agreed that the course exceed their expectations of learning, 88% felt it changed their approach to socially-conscious design, 82% felt it provided them with valuable experience and real-world skills, and nearly all respondents (94%) mentioned that it gave them a good understanding of real world problems and challenges.

Relative to other project-based courses taken, 64% of the respondents felt that they learned more in this design studio while only 25% found it more difficult and 38% found it more time consuming.

It must be noted that there could be a slight bias in the reporting by respondents as the survey was administered by a course instructor (though responses are anonymous). However in open-ended questions later in the survey, most respondents did not shy away from critical feedback.

One interpretation of the responses points to the fact that the material learned in the course and through the design projects is not significantly covered or available in other courses at MIT. This points to a compelling need for offering similar design studios among many departments and enhancing existing curricula to incorporate elements of socially conscious or sustainable design. It may also indicate a greater level of learning through exposure to real-world problems, practical projects and peer review.

Beneficial Role of Guest Speakers, Domain Experts and Peers: In the survey, 95% agreed that guest speakers were engaging and insightful (71% agreed strongly). 76% found their interaction with external domain experts to be productive, while 65% agreed that peer reviews and collaborations were helpful towards their projects. Finally, 88% found the course instructors to be helpful in teaching and mentoring projects (53% strongly agreed). Hence, the diverse participants involved have a valuable role in the success of such a studio design course, particularly one with such a real-world focus.

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1. General Evaluation of Course:
   A. Exceeded my expectations for what I had hoped to learn?
      - Strongly Agree: 47% (8)
      - Agree: 24% (4)
      - Neutral: 29% (5)

   B. Significantly changed my approach towards socially conscious design?
      - Strongly Agree: 47% (8)
      - Agree: 41% (7)
      - Neutral: 12% (2)

   C. Provided me with valuable experience and skills for real-world projects.
      - Strongly Agree: 53% (9)
      - Agree: 29% (5)
      - Neutral: 12% (2)
      - Disagree: 6% (1)

   D. Gave me a good understanding of the problems and challenges in designing appropriate technologies in the real world.
      - Strongly Agree: 53% (9)
      - Agree: 41% (7)
      - Neutral: 6% (1)

2. Relative to other Project Courses:
   A. How much do you think you learned?
      - Much More: 35% (6)
      - More: 29% (5)
      - Same: 29% (3)
      - Less: 6% (1)

   B. Found this to be a difficult course?
      - Strongly Agree: 6% (1)
      - Agree: 19% (3)
      - Neutral: 19% (3)
      - Disagree: 38% (6)
      - Strongly Disagree: 19% (3)

   C. How time-consuming was this course?
      - More: 38% (6)
      - Same: 50% (8)
      - Less: 13% (2)

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Figure 3. General evaluation and comparison with other project-based courses.
Experience with Design Projects:

**How did students find design projects?**

4 main approaches for finding projects:
- Prior interest in a specific problem or area (35%)
- Through joining other classmates (28%)
- From challenges posted on ThinkCycle (17%)
- Speaking with a domain expert (11%)

The instructors had expected that the majority of projects would be selected from the online database, however it seems that personal interest and domain experts have an important role to play in providing ideas or motivation towards projects. It also indicates that instructors must recognize that many people will simply prefer to join others in well defined projects, rather than soliciting their own; this suggests instructors make a greater effort to steer students towards compelling projects and teams.

**Who contributed the most to the projects?**

71% of the respondents felt that over two people contributed to the project. Since most teams consisted of no more than 3 people, this suggests the role of external peers, domain experts and mentors in such design projects. 53% felt that their team members contributed the most while 29% felt they themselves were the primary contributor.

**Time Spent on the Course and Projects:**

77% of the respondents attended the majority of the course sessions and most spent at least 3-5 hours per week on their projects outside class. 88% agreed that they wish to continue working on their projects after the course is completed. This suggests that participants feel personally motivated to engage in their projects, regardless of the requirements of the course (note that most students did not take this course for credit).

**Perceived Impact of the Projects:**

Most respondents agreed that their projects had great potential for critical social impact (59% agreed strongly), while only 36% agreed that their projects had monetary value in the real world. Hence, a key motivation driving students was the perceived social impact of their work, rather than course credit or potential monetary incentives.

**Best Outcomes of the Course Reported by Students**

Summarizing the best outcomes mentioned by respondents: (in no particular order)
- Meeting accomplished practitioners, instructors and like-minded people in the field.
- Awareness and appreciation of problems faced by communities in developing countries.
- Learning social aspects of design and broader social issues in development.
- Collaboration with motivated students across different disciplines.
- Seeing a concept idea develop to a working prototype that tackles a real-world problem.
- Recognizing technical, social and political challenges in bringing products to market.
- Winning top awards in design competitions or receiving patents from course projects.

**Figure 4.** Experience with Design Projects – Perceived Impact, Contributions & Time Spent
Suggestions for Improving Design that Matters Studio: (bold indicates frequent suggestions)

**People**
- Engage a network of faculty members at MIT (working in related areas) to be more involved in the course or actively supervising projects.
- There should be more instructor involvement with projects. Make sure mentors assigned to projects are actually available to work with the teams.
- Make more time available with external domain experts and speakers and less frequent in-class critiques (valuable but repetitive when progress on projects was slow).
- More emphasis and assistance with connecting to organizations that offered design challenges. Have field visits perhaps prior to beginning of class.
- Enhance access to final users of the design project, to get better feedback and iteration.
- Initiate social events and create more class spirit to encourage students to mix socially, and feel part of a supportive community.

**Tools and Resources**
- Easier to use tools for collaboration – posting and browsing was not as fluid as expected.
- Setup a library of source material accessed by students over time, to benefit future students.
- Make tutorials available on various subjects such as programming, electronics etc.

**Course Structure**
- The course should be offered for credit so that students may spend sufficient time on projects instead of hurting their academic time. In one survey question, 94% of the respondents (92% strongly) recommended the course be offered for credit to all students as part of the university curricula. However, one student disagreed, as she felt it should not be required unless people actually have an inclination to work on socially conscious design projects; her reasoning was “to ensure students who register, do so because they are serious and passionate about the topic.”
- There should be a more concerted effort to publicize the class campus-wide, as many students would have liked to take it had they known about it sooner.
- Better organization in the required readings and the class assignment schedule.
- Some undergraduate students suggested the course be more structured and lectures better organized e.g. “Sometimes class sessions seemed like they were strung together without much thought beforehand”. Graduate students preferred the open-ended format.

**Course Content**
- A more serious commitment to ethnographic research before design; many projects would benefit greatly from that.
- Investigate broader scope of projects including political, social and economic models (particularly in non-profit settings).
- Instruction on Media Lab machines and tools earlier in the semester.
- Have video footage of challenges available for students to review; it is more appealing and compelling than verbal descriptions on the website.

**Design Projects**
- Encourage more team building to make people comfortable to share their thoughts and visions without feeling ridiculed.
- Assign groups based on problem domains of interest and ensure diversity by mixing people with different skills, instead of waiting for groups to form naturally.
- Enforce stricter rules about project deadlines.
- Spend more time in the beginning discussing potential projects in class, rather than expecting students to find projects on the website or on their own.
- Instructors should do some background research on potential projects and initiate contact with domain experts, and present well-posed projects at the beginning of the term. This will allow students to get started with projects sooner.
2.4 Online Access and Experience

In this section, participants were asked about their access and exposure to the Internet and collaborative technologies.

**Good Internet Access and Experience:** The responses indicate that nearly 90% of the respondents considered themselves proficient with the Internet and had fast access. All respondents browsed the web and check email several times a day, while many occasionally used online chat. Hence, lack of access or experience is less likely to be a factor in explaining the nature of online interaction for the participants at the MIT design studio.

**Regular Usage of Different Online Modalities:** Comparing different modes of access, email and web usage appears to be similar, while there is a wide distribution of how often some users use instant messaging (daily or weekly). Over 50% do not use instant messaging. Understanding modes of access is important to recognize the ways in which people work and naturally communicate with others on a regular basis. These patterns would suggest that collaborative tools for sharing ongoing design, must also integrate with such modalities in different ways. For example, some participants may prefer to receive email notifications and upload designs via email, instead of using the website. Some may wish to use an instant messaging channel to discuss design instead of using online discussion forums on the web. Though the survey responses in this section suggest some rough trends, detailed responses later provide greater evidence towards this hypothesis.

**Lack of Experience with Online Collaboration?** Among the respondents, 65% had previously created their own websites or webpages. In an open-ended question, most respondents mentioned that they used web-authoring tools such as Microsoft Front Page or Macromedia Dreamweaver, while a few indicated they hand-coded html themselves. Regarding collaboration tools, only one person mentioned tools such as Net-meeting, Chat and Cu-SeeMe and another mentioned using Swiki (shared web-authoring). Most respondents did not indicate any prior experience with online collaboration tools, besides using ThinkCycle. It is entirely possible that they have indeed used such online tools, but simply did not perceive them as being “collaboration tools”. Given their primary backgrounds in engineering (vs. computer science) where much of their design activity is hands-on and face-to-face, many of these respondents may not be naturally inclined to using collaborative software tools like ThinkCycle, particularly on a regular basis in design courses. Hence, the notion of online collaboration itself may be considered a novel activity for most participants. Detailed survey responses in the next section point to similar attitudes. This indicates a greater need for familiarizing students both with online tools and collaborative processes early in the term, and finding ways to make online sharing a natural part of their design activity.
2.5 Experience and Usage of ThinkCycle

In this section participants were asked to reflect on their experiences with the ThinkCycle online collaboration platform, used during the MIT design studio. The section had 15 multiple-choice and 13 open-ended questions.

In summary, all respondents indicated that they had used ThinkCycle during the course. Of the respondents, 59% visited the site at least several times a week and 82% believed it is a useful online tool. 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 to use.

Let's consider the responses in more detail to better understand behavior and attitudes towards online collaboration and the ThinkCycle platform. A key question is - What prevents participants from using an online tool such as ThinkCycle more actively? The poor usability of the tool, unfamiliarity with online collaboration, lack of perceived value of engaging in online interaction or simply a lack of time in a demanding project-based course?

ThinkCycle Usage

As part of the Design that Matters course, all students were expected to post project-related content on ThinkCycle on a regular basis; we expected that most would browse the site every day and post content a few times a week to maintain an updated project archive and solicit feedback. The survey indicates that only 18% of the respondents browsed the ThinkCycle site everyday, while 59% visited several times a week. A critical point is that only 31% posted content on the site several times a week. The question is what sort of content was frequently posted and why? What prevents more active usage of the online site? Aggregate statistics and individual usage data are logged in the ThinkCycle Oracle database, and can be analyzed further if needed. In the survey we primarily try to examine individual attitudes and perceptions towards online collaboration (rather than precise daily usage), particularly in the context of ThinkCycle.

ThinkCycle Usability

53% of the respondents found ThinkCycle complicated and confusing to use, while 30% found it very time-consuming. It must be noted that only 2 respondents (12%) had previously mentioned any prior experience with online collaborative tools. A tutorial on ThinkCycle was made available to students at the beginning of the spring 2002 term. Hence, in the survey 59% of the respondents (10 students) who took the 2002 course had access to the tutorial, and 60% of those (6 students) reviewed it. Half of the respondents that reviewed the tutorial in 2002 found it useful, while 53% of all respondents found it necessary to ask instructors or peers on how to use ThinkCycle. With this basic summary of the responses on usability we will later consider detailed responses to better understand the key reasons preventing more active online interaction.

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Figure 6. ThinkCycle Usage and Usability
**Perceived Contribution of ThinkCycle**

Most respondents (83%) agreed that ThinkCycle is a useful online tool (47% felt strongly). 77% agreed that using ThinkCycle contributed towards their design projects. Finally, 82% felt that they would like to use an online collaboration tool for design projects in the future. Hence, there is a perceived useful role for such online tools in design, however for a number of reasons participants did not fully utilize and engage with the online platform in the studio courses, though they still found it beneficial in their design projects.

More specifically, 70% found viewing and searching content on ThinkCycle useful vs. 57% found posting content useful. In terms of reviewing content, a slightly lower number (44-51%) found both posting reviews and comments from others equally useful. Based on these responses, the main useful aspects include:

1. An easily searchable and indexed repository of ongoing design content.
2. The ability to post content ongoing concepts and resources on projects.
3. Commenting and reading reviews on content posted.

Now we consider more detailed responses underlying individual attitudes towards each of the three themes.

**Useful Aspects of ThinkCycle: 4 Perceived Views**

Respondents articulated several different perspectives of what aspects of ThinkCycle they found most useful. Their responses suggest four key functional views:

**Shared Group Space:** All respondents mentioned the notion of a “shared space” for exchanging files, documents and resources with teammates. In particular they liked the ability to easily upload large files and have the system automatically present their files on the web for easy access to everyone. Being able to notify teammates and coordinating reviews was helpful. Finally, some liked maintaining a private exchange within the team, while disclosing content publicly later.

"Sharing large files with specific members of the group ... and (email) notification when files were uploaded."

"The ‘ThinkSpace’ tool was very helpful for my project. It was nice to have an online space to put all my files and resources and have it accessible for others to view."

"It was pretty powerful as each project could have its own shared space where people could post their documents and design. It was comparable to (or better than) commercial applications that I use at work today for professional collaboration."

"It helped us coordinate certain aspects of the research we were doing, and allowed the team to review drafts of documents."

"Ability to make posting private to a few team members only and then open it to the broader community when the project is completed rather than open the entire time."

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**Figure 7. Perceived ThinkCycle Contribution**
Evolving Project Repository: Another notion commonly expressed is that of an evolving file repository or documentation tool that allows people to capture the ongoing progress of a project. The system allowed version tracking of files and documents, enabling the team to recover the history of project without losing earlier work. This view is somewhat distinct from a “shared space” in that it suggests a temporal evolution and permanence of individual or group project memory.

“A workspace for documents... simple upload and auto document presentation. I do not have to manually code everything. It is like an iterative web building tool for documenting a project.”

“A great site for archiving our on-line resources, references and project data files.”

“I found that ThinkCycle was a great documentation tool for the project. It also was very helpful in showing people what I was working on without having to explain myself various times.”

“(ThinkCycle) was an additional commitment to make a 'permanent' public presentation. As the final project had to be posted on the web, we had to think in terms of the archive.”

“I really like the version tracking feature, which guarantees that I can always recover my latest file version even if someone edits the "master" copy.”

Problem Solvers Area: Some users viewed the site in terms of finding “challenges” and problem solving (rather than sharing or documenting), which is a form of learning in the design process.

“It’s a problem solvers area. Engineers and other people who love to solve problems should check out the stuff on ThinkCycle; there’s a lot of interesting stuff going on over there and especially the kind of problems which directly affect human beings. In solving such problems there’s a lot of satisfaction involved.”

“I found out about my initial cholera project on ThinkCycle. Also later on, it was useful to find out about the potential resources we could access.”

“To browse all of the different real world issues posted.”

“The fact that I can find out about the needs and the answers for those needs in the same webpage.”

“It was also pretty cool to look at all the challenges on the site and see which ones I would be interested in working on “

Open Social Space: Respondents wanted to look at content posted by others, keep track of others progress, make people aware of their work and find relevant experts in certain areas. Many expressed a need to have others review their design projects (though it did not always occur). Social interaction in an openly accessible content space plays a critical role here.

“To look up links other team members posted.”

“The ability to find out what other people in this space are working on.”

“Giving the URL to interested parties so they can look at what our team is doing.”

“Ability to locate people interested in precise issues or have expertise in certain design areas.”

“... There’s also the part about exposure - when I presented my project to the class and the online community in ThinkCycle.”

“... Finally, companies contacted us to patent our idea, thanks to ThinkCycle!”

“It would have helped more if there were more people actively monitoring my project on the site and trying to find information for me.”

These perceived views of the site suggest 4 distinct functions expected by the users, which clearly intersect during regular usage: Coordination (Shared Group Space), Documentation (Evolving Project Repository), Learning (Problem Solvers Area) and Social Interaction (Open Social Space). Such aspects play an important role for collaborative design in distributed settings.
How and when was ThinkCycle used in the design process?

Modes of Usage:
- Gathering Resources – users continued to informally search and gather online resources and add them to their project spaces throughout the design process.
- Asynchronous Collaboration – posting files and working documents for collaborative revision among teammates, particularly for large files not easily handled over email.
- Distributed Collaboration – exchanging ideas with teammates and domain experts in physically disparate locations, particularly when some were working on the field.
- Soliciting Open Review – posting concepts and ideas to gain iterative feedback from peers and a broader audience on ThinkCycle.
- Course Awareness – browsing the course site throughout the semester to check on class assignments, readings, schedules and guest speakers.
- Lurking – casually browsing project spaces to learn what people are working on.

Temporal Phases of Usage:
- Pre-project Gathering – collecting and organizing requirements, resources and background research in the early phase of the project.
- Setting up Projects – once a project was better defined, users setup “ThinkSpaces”, added members and posted “Challenges” in their newly organized project space.
- Posting Completed Work – uploading a week/month’s work after finishing a phase of the design or project work (e.g. CAD models, presentations or write-ups).
- Design Review Updates – most teams uploaded project-related files and updates right before the formal design reviews held in class.
- Documenting – though this ought to be an ongoing activity, many respondents mentioned that they seriously began documenting their projects towards the very end of the term, under pressure from the course instructors.

Situations where ThinkCycle was not considered useful in the design process?
Several respondents also mentioned reasons why they felt the online platform did not contribute as much to their design projects. Let’s consider the key issues in their comments below:

“The team could function and work well without ThinkCycle but it was a useful tool for posting our final designs.”

“For my project, I had the advantage of having a terrific domain expert available on campus. Therefore, our interactions were mostly personal (which was a lot quicker than if we had used the web). However, we did share some information that was posted on the web and that was really helpful. Especially background information was good to post on the site.”

“(ThinkCycle) did not contribute much - there wasn’t much external input on our design concept. What helped most was non-website related approaches like our expert panel.”

“We only used it at the very end, so it wasn’t part of our design process at all really.”

“I think it helped in that others could post information. I only had a couple instances where that happened though. It would have helped more if there were more people actively monitoring my project on the site and trying to find information for me.”

“On the project itself, it (ThinkCycle) was not so much of a resource as an additional commitment to make a ‘permanent’ public presentation.”

Summarizing the key issues:
1. Physical proximity of teammates and domain experts for personal and face-to-face interaction minimized a perceived need for online interaction (though we find others who still found it valuable for asynchronous interaction and project archiving).
2. Lack of people actively monitoring projects online provided less incentive for users to post content.
3. Overhead of posting content was perceived as an additional commitment rather than a natural or integral part of the design process.

These responses are reiterated in the survey question that followed (below), however most mentioned “time” as the most compelling reason for their lack of active interaction.

**What prevented users from posting content on ThinkCycle?**

User responses point towards 6 main issues: (in order of frequency)

1. “Lack of Time” – response most often cited. (50%)
2. Being in regular face-to-face contact with team members and domain experts. (18%)
3. Posting content took too many steps; need a simpler interface like sending email. (12%)
4. Low site traffic or lack of users actively monitoring projects online. (12%)
5. “Critical amount of interesting content not quite there.” – one respondent.

A more reasoned explanation by one respondent suggests that the nature of online usage changed over the course of the design project:

“Depends in fits and starts of a project. For certain periods, I would hardly post, but during an intense project session, I would post a lot of content.”

Several responses suggested the need for simpler interfaces, integrated into existing modes of communication:

“Time consuming and not following natural patterns of our behavior (email communication, etc.)”

“Just don’t get around to doing it - Not always at a computer, when I have my brainwaves... logging in, loading up website and then typing seems like a task - it would be a lot easier if I could email my updates out to a centralized system that pasted them online on my ThinkSpace...”

“If I think about the barrier to entry to another method, email:
1. My email program is open at all times. For ThinkCycle.org, I have to open up that specific page.
2. I have to navigate through the site and find the appropriate subject to post my comment or cross link. Then I have to delete some text in the form and then submit. In email, I just write a subject, paste in the link/ write the comment and send it off. In summary I think it comes down to convenience and a saved 30 seconds per event.”

Several respondents reason as to why they prefer not to engage in online discussions:

“Too much of a hassle to log onto forum everyday.”

“I generally stay focused on the projects I have right in front of me. I may login and surf to see what other people are doing, but I’m more inclined to answer questions posed directly to me than to enter a general chat room discussion.”

“I have never used a discussion forum before. I think discussions are suited to certain individuals and I’m not one of them. I don’t think there is anything wrong with this implementation - it’s just personal preference.”

Another respondent blames the interface and navigation for his lack of comment postings:

“...Navigating the site. Lack of a visual map of where a project is at, and lack of a way to get to the parts I am likely to want to comment on quickly and intuitively.”

**What aspects of ThinkCycle were difficult to use?**

Summarizing users responses, we find 4 key issues pertaining to usability, the majority of which have to do with site navigation and structure (rather than system robustness or functionality).

**Site Navigation:** 65% of the respondents encountered navigational difficulties while browsing the site, which can be categorized into two main types of problematic navigational experiences:

1. *Traversing a Maze:* Browsing a series of hierarchical menus and not being able to return to previous points in the hierarchy.
“(I can’t easily go back in tree hierarchy. From:
menu3 > menu2 > menu3 > menu4 > menu5,
it is usually difficult to (go) back to where one once was.”

“First it was very confusing to navigate around the site, especially to find my ThinkSpace...
However, with time, using the site definitely becomes easier.”

“You do need to click in and out of various areas, though there are many opportunities to take
shortcuts once you learn the navigation system... When I first navigated the site, I didn’t find it
frustrating to use - it was like a maze and I just kept clicking until I found something interesting.”

2. Disorientation: Some users were unable to find content they posted or found themselves
lost somewhere on the site; they did not seem to have a coherent spatial map of the site.

“Sometimes it’s difficult to actually know where you are as in what part of ThinkCycle you are in.
It would be nice to know where you actually are and how you could go to other sections.”

“Once in a while I had a hard time locating where I or another team member had posted
something.”

“Similar kinds of content could end up in vastly different places, leaving us to follow branches
fruitlessly.”

“There were no clear ways to see the stuff on a top level—there were too many clicks to get what
you wanted and no good ways to have a broader overview.

Both of these experiences are not uncommon on many large and complex websites (though it is
rarely studied and reported on such sites). Most users, like the respondents here, gradually learn
the overall structure and navigational shortcuts to effectively browse the sites over time.
However, simple and intuitive navigation seems to play an important role not just for browsing
information but also enabling sustained usage of a collaboration platform. Hence, one must
consider appropriate solutions to address navigational issues that increase user participation.

Organizational Structure: 31% indicated that the organizational structure was non-intuitive, i.e.
hierarchical layers, categorization, and terminology on the site. The “Filespace” referred to here is
a web-based hierarchical file directory, an existing software module integrated into ThinkCycle.

“... the different categories of challenges, comments, resources, etc are a bit confusing. However, with
time, using the site definitely becomes easier.”

“... too many layers and definitions that are not intuitive. Ultimately there is a simple way to do this,
not executed here (though nowhere else either).”

“It was oddly organized. I didn’t know what ThinkSpaces were for a while.”

“The Filespace in particular has a strongly non-intuitive organizational structure, and it’s very difficult
to correct posted mistakes. Even as a regular user, I often lose track of files.”

Batch File Uploading: 12% found it cumbersome and time consuming having to upload multiple
files one at a time, which “restricted the ease of use for file transfers and open access”.

Information Clutter: 12% found the site “cluttered” with “too much information on one page”.

New Features to Improve Online Interaction on ThinkCycle

Improved Navigational Interface:
It is clear that changing or enhancing the existing navigation and organizational aspects on
ThinkCycle would ease most of the difficulties encountered by users. Though the site interface
could be refined, a complete reorganization of the site and database structure would be
infeasible. However, a pop-up site-map that tracks users on the site and provides context-
dependent help and glossary of terms could make navigation on a complex site more intuitive.
**Asynchronous Content Updates:**
24% of the respondents suggested the need for asynchronous content updates to the online site, particularly via email. Batch file uploading can be addressed by client-side FTP-like tools or email-based mechanisms that parse attachments and upload them to the site.

"Having it connected to email so I can input entries via email without having to load website."

"If it were more integrated into my normal mail program somehow, if it had ways to create more content on-site."

"Off-line use capabilities, for users with infrequent, unreliable, or unbearably slow connections to the internet. In particular:
+ the ability to batch-upload ThinkCycle content developed off-line. In other words, I generate a pile of reference hyperlinks, images, topics, notes, comments, etc, and email or ftp them to ThinkCycle in a compressed packet the next time I’m connected to the Internet.
+ similarly, the ability to download a text or plain HTML overview of current topics on the site. The email update announcements of new topics, etc go partway towards this goal. It would be nice if I could request an email summary of all the activity in a particular topic over some specified period of time."

It also becomes clear that designers working on concept sketches find it cumbersome to scan and upload them regularly on the site. Hence, they suggested integrated scanning and sketching tools that can be used to scan/draw and upload several sketches to the site easily.

"Have a drawing tool (Java) that connects to pen input for making sketches, and have an integrated scanning tool that immediately puts scans on the site."

"Being able to sketch online would be great – not having to operate in another environment before porting to web."

One solution is to develop an offline client application that asynchronously provides users with requested updates from the site and allows them to easily post text-based content (both without having to go online and browse the site). Later sketching and integrated scanning for batch uploads to the site can be added. Integrating such activities and parsing content via email is non-trivial. However, a Java-based client is being developed to test this approach.

**Real-time Collaboration Tools:**
It was expected that many participants would request real-time collaboration, however a significant number (35%) requested online chat integrated on the site. This suggests that participants view the design activity as a social process, with the need for spontaneous conversations with online peers supported by tools such as chat (in addition to email).

"When a team member is on-line I would like to chat with them. I use MSN with my team members in Montana and it helps to know when they are on-line, and give me instant access to them."

Only three respondents suggested other real-time collaboration tools such as shared sketching, video-conferencing and shared file annotation. However, these were considered "interesting" options that may augment online interactions rather than a critical part of collaborative design.

"Ability to draw stuff on it - like a designers easel something like that would make it so more realistic esp. if communities from diverse places are communicating with each other."

"Video conferencing would be an interesting collaboration feature. Perhaps having a video stream on a split window website allowing people to surf the site while talking about the project they are working on. This would be incredibly useful for showing someone your work while simultaneously getting feedback."

"A way to work on the same file and track changes made by each user."

Many off-the-shelf packages provide such functionality, however naturally integrating them into the design process and the user interface/database in an online site is far more challenging.
3. Key Themes and Recommendations

3.1 On Studio Courses for Sustainable Design

From responses to the studio design courses conducted over two consecutive years, it is clear that courses focusing on sustainable design through hands-on learning have a broad appeal among students, serve a valuable role in university curricula, and show concrete outcomes in terms of exposure, learning and working design projects. However, the success of the course requires not just well devised curricula and notable practitioners as guest speakers, but better preparation by instructors to develop well-posed design projects, more team/project mentoring, and greater effort to connect external organizations and domain experts with students throughout the design process. Opportunities for fieldwork before, during and after the course should be encouraged to make the design projects more relevant and meaningful to both students and stakeholders.

Though some students enjoyed an open-ended studio, others (typically undergrads) suggested added structure and deadlines to improve student involvement and project completion. Finally, most students agreed that the studio should be offered for credit to provide an additional incentive for them to seriously commit more time towards their design projects. However, course-grading schemes should be carefully devised to encourage collaboration, peer review and real-world assessment rather than emphasis on novel artifacts and competitive metrics.

Sustaining such studio courses in university settings requires: 1) strong commitment from university administration in recognizing the need and value for such courses to enhance real-world learning, 2) strong commitment from faculty in taking a lead on formally teaching novel studio courses or integrating socially-relevant design curricula into existing courses, 3) an important role for student instructors and domain experts mentoring teams during the design process, and 4) opening academic barriers to reach out to industry and field organizations to create mutually relevant partnerships towards real-world design projects.

3.2 On Collaborative Design Platforms

The survey indicates that participants find online collaboration tools useful and did indeed use ThinkCycle during the course. From usage patterns it seems clear that browsing and searching information was more prevalent than posting content. The web seems to be more useful as a medium for dissemination of information on sustainable design and resources, rather than primarily as a collaboration tool. Clearly participants do collaborate both face-to-face and using electronic modalities such as email and chat. However to encourage active online design collaboration, the affordances and usability of online tools must match their expectations with existing channels of communication.

Most respondents mentioned lack of time, being face-to-face, the overhead of posting content and lack of users monitoring their projects online as key reasons for not posting content frequently. Half the participants also found ThinkCycle somewhat complicated and time consuming to use, due to difficulties in navigation, structure and some interface issues related to file uploading. However, most managed to learn to use the system over time and adapt to the structure of the site.

The survey responses suggest four ways in which users viewed the online system: 1) a shared group space, 2) an evolving project repository, 3) a problem solvers area and 4) an open social space. These critical affordances (though often intersecting) must be supported in online collaborative design tool. In addition to an improved navigational interface, many users requested tools for asynchronous content updates (via email or ftp-like clients) and real-time chat. Overall responses suggest that users view design as a social process rather than simply one of archiving and exchanging data.
Navigation and interface issues can be gradually resolved, yet social/cultural factors seem to have a more critical influence. Among engineering students there is a lack of prior experience and predisposition towards the notion of online collaboration; much of their design work tends to be hands-on and face-to-face. Hence, such online tools are perceived as an additional commitment, rather than a natural part of the design process. There needs to be greater exposure to such tools including some training and examples of how it can be useful in the design process. In addition, online interaction and deliverables should be gradually introduced to students during the course, rather than expected from the start. Finally, having external organizations and domain experts (not co-located with the teams) actively reviewing the projects, serves as a more meaningful incentive to have teams place their evolving designs online and use such an approach.

4. **Next Phase of Study: Open Issues for Inquiry**

The survey was unable to address many issues that will be further explored using intensive interviews with a few key participants from the course. The main themes of inquiry include:

A. **Nature of Design Process:** Understanding the evolution of design projects including key design criteria and decisions, social interactions, and artifacts created. How did the teams research, document and negotiate design constraints and concepts? How was peer-review solicited and incorporated in the design? What influenced the design process the most, and what were key motivations behind critical design decisions? How did the team use ThinkCycle in the design process?

B. **External Linkages:** In what manner did students interact with external organizations and domain experts throughout their design process? How did they seek out such linkages and maintain them through the course? How did these interactions influence their work and learning? What were incentives for external peers to get involved, and how did they benefit from the interaction?

C. **Intellectual Property and Public Disclosure:** Examine individual experience in prior design projects in terms of disclosure and patents? To what extent did team members disclose their designs publicly (in class or website)? What factors prevented them from greater disclosure (competition, maturity of ideas, overhead involved, or market potential)? To what extent did the design projects benefit from external input? Does the team plan to field-test, patent, license or disclose their ideas in the public domain? Do team-members wish to participate in open source projects in the future? Under what conditions?

4.1 **Protocol for Interviews at MIT**

Intensive and unstructured interviews will be conducted with selected participants in the course; particularly ones who seemed most engaged in the design projects (lead members of groups, key domain experts, and instructors). All interviews will be audio taped with permission from informants. Participants will be asked a few probing questions, requested to show working sketches, draw design process and social interactions. The goal is to gain a rich insight into their personal attitudes, group dynamics and actual design approach in terms of the main themes of the inquiry. A preliminary interview protocol with proposed questions is as follows:

Q1. Why did you join this studio? What did you expect to gain?

Q2. Why did you decide to work on this design project?

Q3. How was the team formed and whom did you consult in the process?

Q4. Describe to me how the problem constraints and design concepts evolved? Draw a timeline and show me the significant decisions your team made? Show me working sketches?
Q5. How did your team work together and communicate during the process? How did you resolve and negotiate key decisions?

Q6. How did other organizations and domain experts help in the design process? What do you think motivated them to get involved? What was their key contribution?

Q7. When did you use ThinkCycle in the process? Why did you find it helpful or not? What online tools would have supported your design process better?

Q8. In your previous projects, did you work in teams and what were some of the best outcomes? Did your prior projects get published or patented?

Q9. Did you feel comfortable discussing your project with others outside class? How did you solicit external review of the project? What prevented you from disclosing it more publicly?

Q10. Do you plan to continue working on this project? Will you field-test, license or patent it? Why or why not? If a company approached you about it, what would you do?

Q11. How do you think the project would have the most impact – through full public disclosure (open source) or proprietary licensing? Which do you think makes most sense in your project and why? Having gone thru this project, what do you think about the “open source” approach?

Q12. What are your long-term career plans? Where do you see yourself in 5 years? Do you see yourself playing a role in addressing social or environmental problems? How do you feel you can have the most impact?

These questions have been pilot-tested in an informal interview with one informant on July 7th. I plan to simplify and adapt them accordingly for each interview in the future. Early results from the pilot interview confirm some of the findings from the survey, however several in-depth answers also contradict the simple nature of responses reported in the survey. These will be summarized and compared with survey responses in an upcoming report.

4.2 Bangalore Case Study

A similar design studio has been initiated in Bangalore, India from Feb 2002 onwards. The course is titled “Learning from Grassroots Innovators”\(^2\), and is jointly organized by the Srishti School of Art, Design & Technology, Indian Institute of Sciences (IISc), NTTF Design Program and National Innovation Foundation. It includes students from mechanical engineering, design and rural technology specialties. The students in Bangalore did not use the ThinkCycle online platform for their projects. The student backgrounds, projects and curricular approach in the Bangalore course will provide a unique and distinct setting to conduct this study. The online survey and interviews will be conducted with students participating in the Bangalore studio in July/August. The interviews could be done by faculty at Bangalore or myself (if time permits). A comparative analysis of responses from both courses may be feasible or simply provide a different perspective. This needs to be determined from discussions with faculty there and early survey responses.

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\(^2\) http://cpdm.iisc.ernet.in/dtm.htm
APPENDIX: Online Questionnaire

This is an early draft version of the 5-part online questionnaire with 60 questions. For many questions, a Likert scale will be used to provide a series of statements to which participants can indicate degrees of agreement or disagreement (shown as 1-5 below). After a pilot test, the online survey was revised; some questions were refined and 20 additional questions were added to the new online survey (not shown below).

A. Demographic Information
1. Current Academic Status (Undergrad, MS, PhD, Graduated)
2. Degree Major
3. Age
4. Gender

B. General Attitudes towards Collaboration and Course Projects
5. I prefer to work independently on assignments and projects than in groups. (rate 1-5)
6. I feel that working with others on assignments and projects is more helpful than working alone. (rate 1-5)
7. The last time I was involved in a group project, I found it to be an enjoyable and worthwhile experience. (rate 1-5)
8. I view the field of my design project as intensely competitive. (rate 1-5)
9. I don’t want to share my project designs openly, because others may use it without much credit or benefit to me. (rate 1-5)
10. I don’t want to share my project designs openly, because my ideas are too premature for others to review. (rate 1-5)
11. I don’t want to share my project designs openly, because it takes too much effort to do so. (rate 1-5)

C. Course Evaluation (only applicable to participants in studio courses)
1. Why did you decide to take this studio design course?
2. The course exceeded my expectations for what I had hoped to learn? (rate 1-5)
3. The course significantly changed my approach towards socially conscious design? (rate 1-5)
4. The course provided me with valuable experience and skills for real-world projects. (rate 1-5)
5. The course gave me a very good understanding of the problems and challenges in designing appropriate technologies in the real world. (rate 1-5)
6. I found the instructors helpful in teaching and mentoring projects. (rate 1-5)
7. I found the guest speakers engaging and insightful. (rate 1-5)
8. I found the student peer-reviews and collaborations helpful towards my project. (rate 1-5)
9. I found my interaction with external domain experts and organizations, during my project to be very productive. (rate 1-5)
10. Rate your learning experience in this course relative to other project-based design courses you have taken. (rate 1-5)
11. I felt that doing the projects for this course was a frustrating and unproductive experience. (rate 1-5)
12. I wish to seriously continue working on my project even after the course is completed. (rate 1-5)
13. Rate the difficulty of this course relative to other project-based design courses you have taken. (rate 1-5)
14. Rate your attendance and participation in the class sessions. (rate 1-5)
15. I consider this course to be very time-consuming. (rate 1-5)
16. How many hours a week on average did you spend on this course outside class? (less than 5, 5-10, 10-20, 20-30, more than 30)
17. I consider this course to be intensely competitive. (rate 1-5)
18. I recommend this course be offered as part of the university curricula for credit to all students in the future. (rate 1-5)
19. What were the best outcomes of this course for you?
20. What suggestions can you make to improve the course?

D. Access and Experience with Online Tools
21. How would you rate your proficiency with the Internet? (novice, casual, experienced, expert)
22. Where do you access the Internet most frequently? (home, campus, work, public places, other)
23. Usually how fast is your Internet connection? (slow and unreliable dialup modem, fast dialup modem, cable/DSL service, high-speed T1 line)
24. How often do you access the Internet? (several times a day, once a day, once a week, every month)
25. How often do you check your email? (several times a day, once a day, every week, every month)
26. How often do you use instant messaging or chat? (never, several times a day, every week, rarely)
27. Have you used any web-page authoring or online collaboration tools before? If so which ones?
28. Have you created your own websites or web pages? If so, please list some sample URLs here.
E. Attitudes towards using ThinkCycle (only for participants using ThinkCycle)

Basic Usage and Usefulness

1. How often do you visit the ThinkCycle site? (several times a day, once a day, once a week, every month, rarely)
2. Do you believe this online platform is a useful tool? (rate 1-5) If so Why?
3. What aspect of this platform do you find most useful? (open-ended)
4. Did you find the tool very complicated or confusing to use? (rate 1-5)
5. Did you find using the tool very time consuming? (rate 1-5)
6. What aspects do you find most difficult, confusing or time consuming to use? (open-ended)
7. Did you find it necessary to review the ThinkCycle tutorial? (rate 1-5)
8. Did you find it necessary to ask the instructors or peers how to use ThinkCycle? (rate 1-5)
9. When did you use ThinkCycle most often during the course? (open-ended)

Reviewing Content

10. I find that viewing and searching content on ThinkCycle is useful. (rate 1-5)
11. How often do you view content online? (several times a day, once a day, once a week, every month, rarely)
12. What sort of content do you view most frequently? (open-ended)
13. I like reviewing and commenting on content posted by others. (rate 1-5)
14. I find comments on my content posted by others useful. (rate 1-5)
15. You posted XXX Comments & XXX Cross-Links? What do you think prevents you from posting more comments and cross-links regularly?

Posting Content

16. I find that posting ongoing resources, links and concepts for my project on ThinkCycle is useful. (rate 1-5)
17. How often do you post content online? (several times a day, once a day, once a week, every month, rarely)
18. What sort of content do you post most frequently? (open-ended)
19. You posted XXX notes? What do you think prevents you from posting your content on ThinkCycle regularly? (open-ended)
20. You are subscribed to XXX forums and you posted XXX messages? What do you think prevents you from using the discussion forums to post messages regularly?

Concluding Question

21. Do you think using ThinkCycle contributed towards helping you on your design project? (rate 1-5). If so, please state how OR if not, please describe why?
Understanding the Role of Online Tools and Social Incentives Towards Collaborative Design & Learning in Studio Courses

Consent for Participation in Study and Use of Questionnaire and Audio-taped Information

Principal Investigator: Nitin Sawhney, {nitin@media.mit.edu}
MIT Media Laboratory, May-June 2002

This study is being conducted to assess the nature of collaborative design and learning outcomes from individual and team projects in experimental design studios and the use of an online collaboration platform, ThinkCycle. The study solicits voluntary participation in an online questionnaire, optional follow-up interviews and an optional focus group discussion.

I fully understand that my participation in the study is voluntary and that I am free to withdraw my consent and discontinue participation at any time without prejudice to myself. The procedures and purposes of the study have been explained to me and the investigator has offered to answer any inquiries concerning them. I understand that I may voluntarily answer questions in the online questionnaire and that I have no obligation to answer every question. I may also separately agree to be interviewed as a follow-up to this questionnaire, if needed in the future. My identity and all personal information expressed by me will be kept anonymous in any reporting by the researchers. My participation or non-participation in this study will in no way affect grades assigned to me on any courses I am enrolled in at my university. For my participation in this study I will receive a free T-shirt, even if I choose to withdraw from the study early.

If I am asked for a follow-up interview, I understand that my interview will be audio taped if I give permission to the investigators. However, I can still participate in the study if I choose not to be audio taped. The audiotapes will only be heard by the investigators for subsequent transcription and analysis, unless I specify otherwise. All audiotapes will be stored in a locked cabinet, accessible only to the investigators. In the unlikely event that it is impossible to provide such secure storage space, the audiotapes will be destroyed.

In the unlikely event of physical injury resulting from participation in this research, I understand that medical treatment will be available from the M.I.T. Medical Department, including first aid emergency treatment and follow-up care as needed, and that my insurance carrier may be billed for the cost of such treatment. However, no compensation can be provided for medical care apart from the foregoing. I further understand that making such medical treatment available; or providing it does not imply that such injury is the Investigator’s fault. I also understand that by my participation in this study I am not waiving any of my legal rights. For further information contact the Institute’s Insurance and Legal Affairs Office at 253-2882.

I understand that I may also contact the Chairman of the Committee on the Use of Humans as Experimental Subjects, M.I.T. 253-6787, if I feel I have been treated unfairly as a subject.

I agree to be interviewed after the questionnaire if needed: Yes____ No____

I agree to be audio taped in this follow-up interview: Yes____ No____

I agree to let the investigators contact me in the future: Yes____ No____

Address________________________________________ Phone_________

Name__________________________________________

Signature_______________________________________ Date____________

Principle Investigator___________________________ Date____________

MIT COUHES APPLICATION No. 2915 Participants Code:______