

Theme:

Title:

Teaching Knowledge Management using Distributed Practice Simulation

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Abstract:

The paper describes attempts by the authors to convey the importance of teamwork in architecture to students, be it in the process of architecture or the object itself. One of the main postulates of the work is that pedagogically, teamwork is better trained than taught. This is further compounded when the technological burden of distributed practice is introduced. Using Internet based communication technologies, the authors have sought to create a design studio environment that simulates real world situations where major planning partners are located in different cities and even different countries. Using experience gained over four years of networked studios, the authors were able to enrol five other universities for a semester-long experimental design studio. In essence, the students undertook to solve the design problem in teams spread over different universities. From 43 students, 14 teams (each with 3 members and one with 4 members) were assembled with no two students from the same university in the same team. Furthermore, each team was assigned a tutor from a fourth (or fifth) university. The different universities were far enough separated so as to preclude easy face to face meetings. Instead, the Internet was used as a communication medium. The entire range of available technologies was put to use. A central web site which logged user presence served as a virtual "place" where the students and tutors could meet to carry out informal discussions or arrange to transfer the discussions elsewhere (e.g. to a chat room or a videoconference). The web site platform also provided the entire group with supporting information such as personal diaries, common calendar functions, email lists and directories of student work. The students made their work available on the web throughout the semester in order to communicate with their tutor as well as with one another. Essential to the successful communication was an initial acquaintance session. This took the form of a 3-day workshop at the beginning of the semester. While this workshop ostensibly focussed on the design problem, it effectively served as a social engineering exercise in order to shake out compatibility among potential team members. After the workshop, the group met again 15 week later for a final review. Halfway through the semester, the individual teams travelled to their tutors for a mid-term review. Otherwise, all communication took place over the Internet (or through conventional telecommunication methods). The theme itself was certainly self-referential: to design a centre for a virtual university. This cross-pollination of design method and design theme was an additional encumbrance for most students, but also provided a fertile bed for a wide range of design solutions. It is important to note that all of the teams were able to complete the assignment and post-semester questionnaires show an overwhelming positive reaction to the experimental studio, notwithstanding the high costs of travel and telephone. The paper discusses the feedback from the students and possible implications for future iterations of the concept.

Keywords:

CSCW, Distributed Teamwork, Virtual Design Studios

Introduction

The Institute for Industrial Building Production (ifib) has over the past four years, undertaken to integrate Internet based communication technologies into the design studio setting. This was initially carried out

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1



with the goal of introducing the students to web based presentation technologies. This first generation of net based design studios (or *netzentwurf* in German) was successful in quickly defining four main methods of web based design presentation [Russell et al, 1999]. Further development of the *Netzentwurf* concept saw the introduction of parallel studios where students from different Universities carried out design studios simultaneously. This was attempted at the local, regional and international level. [Elger, Russell 2000] However, the lack of communication among the second-generation participants clearly exposed a deficit in the communication pedagogy. Other experience in teaching co-operative practices through seminars and the like also met with lacklustre results. It became clear that co-operation is better trained than taught. In reviewing the first three years' work, the organisers sought to alleviate these deficiencies through clearly structured net-based co-operation in a design studio setting. Thus was born the seeds of the Liquid Campus.

Parallel to the ongoing design studios, the authors were able to present preliminary findings at events such as the eCAADe Conference in Weimar in July 2000. This in turn provoked interest among other institutions and in October 2000, members from seven universities met to discuss the terms of engagement for the following semester. Taking lessons from the *netzentwurf* project as well as the Virtual Upperrhine University of Architecture (VuuA) [Koch, Russell, 2000], tutors from the seven universities felt that what necessary was a test of the pure co-operation model. One of the partner universities withdrew leaving six universities to carry out the experiment:

- the Technical University of Aachen,
- the Brandenburg Technical University Cottbus,
- the University of Kaiserslautern,
- the University of Karlsruhe,
- the University of Siegen and
- the Bauhaus University Weimar.

The rules for the summer 2001 Semester were thus: upper level students of architecture (usually 3rd and 4th year) were grouped into teams of three students each where all three group members are situated at three different universities. In order to prevent one of the students receiving preferential treatment, the group was supported and criticised from a tutor at a fourth university. Owing to the flexibility inherent in the upper level course and design assignment selection, the number of students taking part ranged from 3 to 11 students. Despite this imbalance, it was still possible to distribute 43 students into 14 teams of 3 students each (with one group made up of 4 students) and still have the tutor originate from a fourth (or fifth) university.

Experience with distributed groups carried out one year earlier demonstrated the invaluable and almost indispensable value of a kick off workshop. As well, efforts to create a net-based community without physically meeting [Rügemer, Russell, 2000] only served to reinforce the importance of such workshops. Thus, the semester truly got underway for the students at an initial three-day workshop held on the island of Rügen, Germany. Through various group assignments over two days that allowed the students to work for short periods together, the students were able to get to know one another. The assignments served to start the discussion about the design assignment, but more importantly served as a form of social engineering. The students were then asked to form their three person groups on the third day. The groups met with their tutor for a few hours and then the entire group returned to their respective universities.

The students were thus to develop a collective design solution using the Internet as the primary communications medium. While physical meetings were not prohibited, it was felt that the generally large distances between the participating universities precluded all but the most necessary physical meetings. Each tutor carried out a mid-term review (where his or her students travelled to the tutor) with a final collective review held at the end of the semester.

Central to the design studio infrastructure was the netzentwurf platform. Over the previous three years, the authors (with support of researchers at ifib) developed a robust, design oriented communication platform. This is a simple Microsoft ASP solution that uses MS Access as the main database. Using experience gained from research into Computer Supported Co-operative Work (CSCW) at ifib in Karlsruhe, the organisers were able to avoid common problems with the platform and offer the students a stable and feature packed platform.

The Netzentwurf platform (<http://www.netzentwurf.de>) is primarily a project-tracking platform. Through diary and news functions, events are logged on the platform. It does not manage documents, but rather attempts to provide information about the project and its participants over the course of the design studio. However, the active display of currently logged on members allowed the platform to become more than simply a database fuelled web site: the netzentwurf platform became a place [Russell, 2001]. Through a simple chat function, users could instigate impromptu informal discussions. Furthermore, the continually updated display of "Who's Online" reinforced the collective sense of community among the students and tutors alike. Additional functions such a competency profile also helped to reinforce the collective identity of the entire project. (See Figure 1)

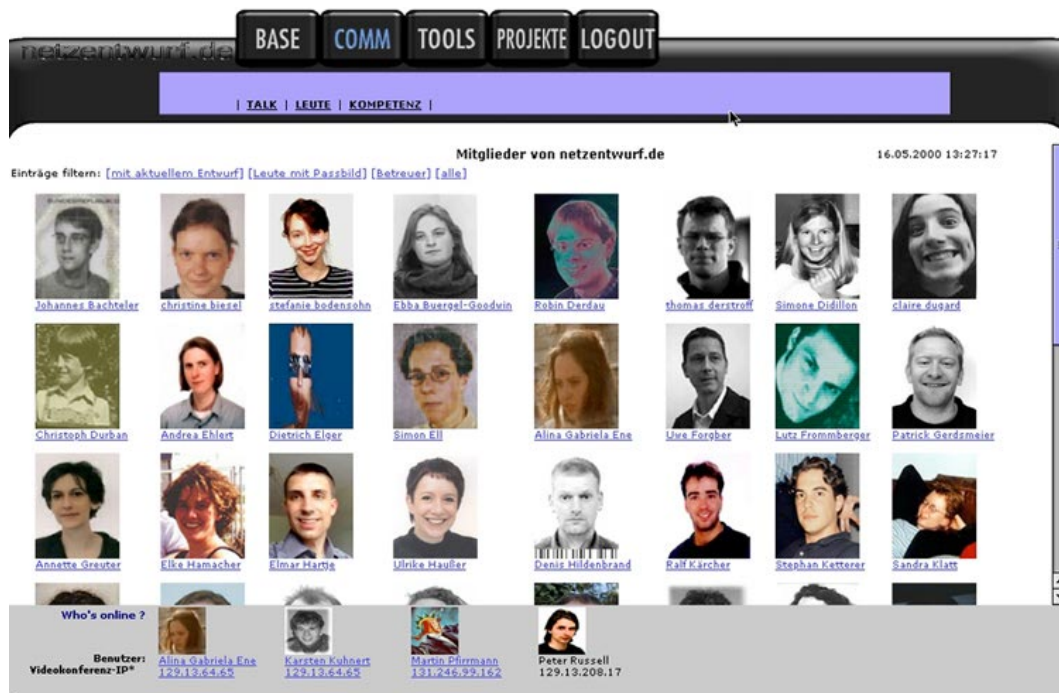


Figure 1 - Netzentwurf Platform

The Netzentwurf Platform became the central place to meet. It allowed the students to carry on the kind of impromptu discussions that are part of the more traditional design studio setting. The actual communication between the students themselves or the students and their tutors used the entire range of Internet based communication. In a pinch, the old reliable telephone system came into play. Nonetheless, the students for the most part attempted to follow the spirit of the experiment and to confine their communication to Internet based channels. Each group was left to develop their own communication rhythms and methods. While this was initially severely time intensive, it allowed the student teams to achieve their own optimal design communication methods.

The groups were all given basic courses in Internet communication and presentation techniques. The goal was to provide technical (and moral) support locally while encouraging the design criticism to originate with the remotely situated tutor. The Netzentwurf platform is outfitted with a primitive chat function,

which proved to be perhaps the most reliable, if not somewhat slower, communication channel. The authors sought to emphasise a cross platform videoconference software named iVisit (<http://www.ivisit.com>). The advantages of iVisit (versions are available for Apple Macintosh as well as Microsoft Windows operating systems) and its relatively compact size made it rather attractive to a community of students and teachers with a heterogeneous pool of computers and systems. iVisit also proved to give a relatively high throughput of video and audio. However, unlike simpler communication channels such as chat or icq (I-Seek-You), iVisit used a set of three exotic computer "ports". This proved fatal for the program when it came up against the various firewalls at the different universities. The Microsoft videoconference counterpart named "NetMeeting" proved unusable for similar reasons (it uses five exotic ports) as well as its availability as only a purely Windows version.



Figure 2 - iVisit Session

As was mentioned, the tutors themselves came to the experiment with their own range of competencies. While this was enriching to the group as a whole, some of the student groups felt that their assigned tutor was better left to consultations in their own field. The Netzentwurf Platform also provided a competency map to the participants. It was intended that each participant (students and tutors alike) would enter their particular competencies into the database and that students who sought specific expertise would be provided with a list of those members with that competency. With over 750 members on the platform at the time of the Liquid Campus experiment, it was hoped that these types of filter mechanisms would alleviate some of the information flood that confronted the students and tutors. This however, was difficult to achieve; not least owing to the differing range of experience with Internet based design studios. Furthermore, the topic of the design studio further complicated the role of the tutors in the entire process.

The design assignment itself was to design the place or space for a virtual university (such as the EU Funded WINDS project). The tutors put the challenge to the students, that even a "virtual university" would need some kind of physical infrastructure. By choosing this design topic, the students were met

with an overlap of design theme and design methodology. Furthermore, the Netzentwurf platform served as a prototype as to how a virtual community could be organised. It has to be noted that not all of the tutors involved in the project were fully prepared to provide criticism and commentary on the design and development of a "virtual" architecture. The differing expertise among the tutors reflected, however, the varied range of solutions that the students presented.

Each student group was given a separate ftp account where their design work was to be placed. The Platform grouped the individual students into their groups according to which members used similar URLs to identify their work. In previous Netzentwurf iterations, this allowed the students to dynamically regroup the student teams. In this case, it often caused confusion. The students also underestimated the additional overhead involved in presenting their work in progress on the web.

In traditional design studio criticism, the student will arrange a meeting time with the tutor. At the time of the meeting, the students will usually arrive with a host of design sketches, drawings and models. The student will then explain the design intentions to the tutor who will then respond with criticism and commentary. By placing their work on the Internet, the nature of this design review changed in two major respects.

Firstly, the physical separation of the student and tutor means that the student must put more work into the preparation of the sketches. This usually means scanning the drawings and photographing the models and then putting this raw material into an HTML web page so that the work is reachable by the tutor. This additional work by the student means that less time is available for "pure design". Questionnaires carried out after the semester had concluded confirmed this view.

This separation of presentation by the student and viewing by the tutor also affects the second change: the nature of the critique. Because the work is (usually) available beforehand, the tutor is allowed more reflection in preparing commentary on the student's work. This in turn allows the tutor and student to spend more time in the critique discussing the work.

The actual experience during the Liquid Campus was somewhat more sobering. The complexity of getting three students and a tutor online was the first daunting challenge. The aforementioned problems with firewalls meant that the allotted time (usually one hour) was more than half taken up in attempts to get all four partners online simultaneously. In addition, the connections cannot be said to have been entirely robust so that frequently one or more participants suddenly being unavailable interrupted the discussion. This led to very drawn out and at times excruciating discussions. (See Figure 2)

The problems encountered using iVisit led the individual groups to develop their own communication methods. IRC, ICQ and other Chat based methods were commonly used, as well as newsgroups, which also helped to document the dialogue. Other groups used instant messenger systems from AOL or Yahoo to chat or converse (with Yahoo's sound support). The students proved rather flexible and adept at finding new ways to communicate, however one group agreed to meet physically in order to better work together.

All groups travelled to their tutors for a one-day mid-term review. Owing to the considerable amount of time devoted to communication issues, the quality of the work was at this point quite low. However, once each group had worked out their best way of communicating, the actual design discussions took off. (see Figure 3) The tutors sought to meet (over the Internet) with their students at least once a week. This proved essential to keeping the students working on their projects as the frustration levels often exceeded the enthusiasm for the project.

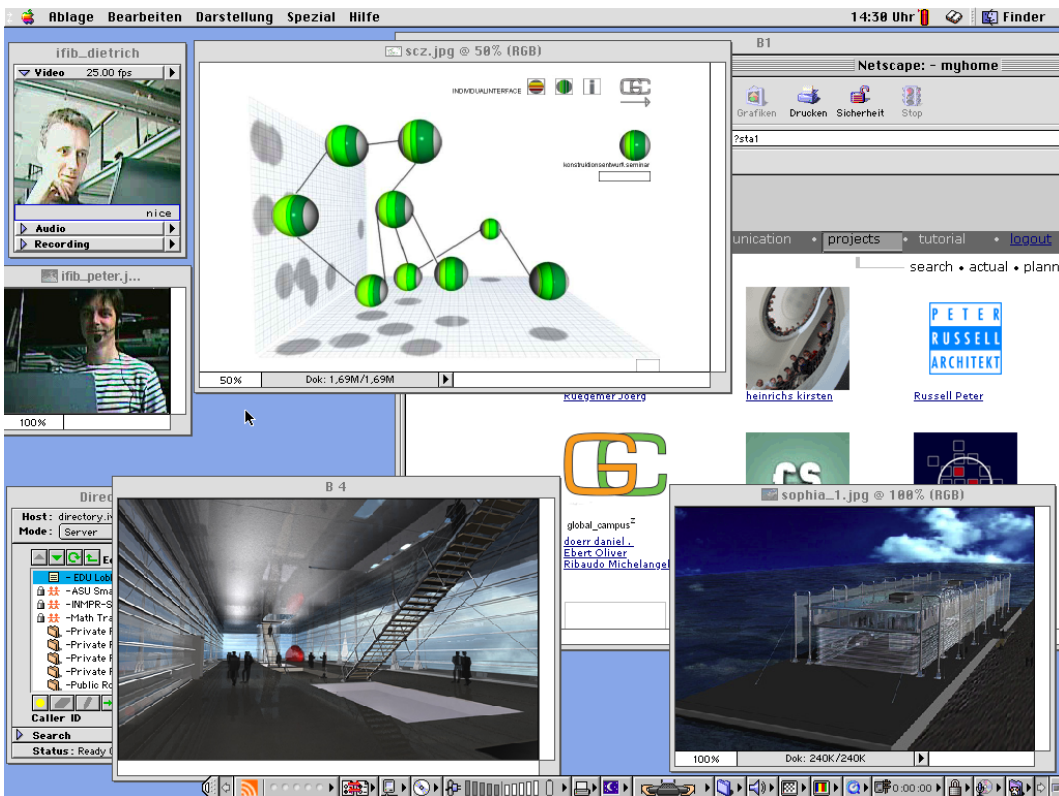


Figure 3 - Tutor Discussion

All 43 students finished the project in their original groups. A final review was held in Frankfurt am Main in the Museum for Kommunikation, Frankfurt (<http://www.museumsstiftung.de/frankfurt>) over two days. There, each group got the chance to present their design solutions in a more traditional environment with a review by the tutors, fellow students and guests. The students presented their web sites and explained their methodology during these sessions. The special character of the Museum for Kommunikation (it is a renowned building in Germany served to remind the group of the differences between virtual and real architecture. As well, its neutral position to the entire group and the public nature of the sessions helped to heighten the impact of the final reviews. (see Figure 4)



Figure 4 - Final Presentation

Although just over half of the students said that they would undertake another such design studio, almost all of them said that they would recommend the experience to their fellow students. From the standpoint of the tutors, it is clear that there is a great need to help train future practitioners in communication and co-operation. However, it must be clear for all participants that a project such as the Liquid Campus should not be undertaken without careful consideration. It requires a much larger outlay of time, money and energy than standard studios. This is true for both the tutors and the students. Nonetheless, the results of the project show how rewarding the extra outlay can be.

The work can be seen in the "finished projects" section on the Netzentwurf Platform.

Literature

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Links

Netzentwurf Platform <http://www.netzentwurf.de>

Institute für Industrielle Bauproduktion, Universität Karlsruhe

<http://www.ifib.uni-karlsruhe.de>

Lehrgebiet Computergestütztes Planen in der Architektur, RWTH Aachen

<http://caad.arch.rwth-aachen>