DISTRIBUTED DESIGN STUDIO – EVALUATION OF THREE WAY COLLABORATION

Kristina Lauche[1], Erik Bohemia[2], Petra Badke-Schaub[1], Colin Wilson[2], Lau Langeveld[1], Chris Conner[2], and Will Titley[3]

[1]Delft University of Technology, [2]Northumbria University, [3]Napier University

ABSTRACT

The Globally Distributed Design Studio (GDDS) was developed as a course in which students could practice virtual collaboration and designer-client interaction. Geographical distance was used to provide students with an experiential learning environment to prepare them for collaboration in a distributed product development process. The GDDS course was established between three universities. The results of a mid-term course evaluation show that most of the students found it an interesting and motivating experience and felt they had improved their skills for virtual teamwork and designer-client communication. In terms of the student feedback, the course can be seen as successful even more so for collaboration across greater distance.

Keywords: virtual teamwork, client interaction, experiential learning

1 INTRODUCTION

It has been commonly recognized that product development is becoming a globally distributed activity: Products are increasingly developed for markets anywhere in the world, and manufacturing may no longer be carried out in a nearby production facility [1-3]. Large corporations are using design teams around the globe to pass on their results to the next 'shift' in another continent, thereby making the most of time differences. While there may be obvious business advantages, virtual collaboration is not an easy task for those involved. A recent study of product development teams in industry showed that the quality of teamwork and communication becomes even more important as the dispersion increases [4-7]. Therefore, design graduates will need to be capable of distance communication and virtual product development [8-11]. Yet most educational activities are still geared towards face-to-face contacts and grounded within the culture of our own educational system. There have been a number of projects aimed at fostering international collaboration, typically as projects on which students from several institutions work together [12-14]. In contrast, this course was set up to link students as designer and client teams. In their own institution, they would work face-to-face as a design team, but communicate across distance with their client team in another university (see figure 1 below).

The three universities synchronised four key project outcomes within the course. At each specific step the 'client' or 'designer' student group from one university exchanged and communicated their project outcomes, such as Design Brief, (Step 3) Design Concepts (Step 4), Detailed Design (Step 6), and Final Design Presentation (Step 11), to their partner groups at the other university.

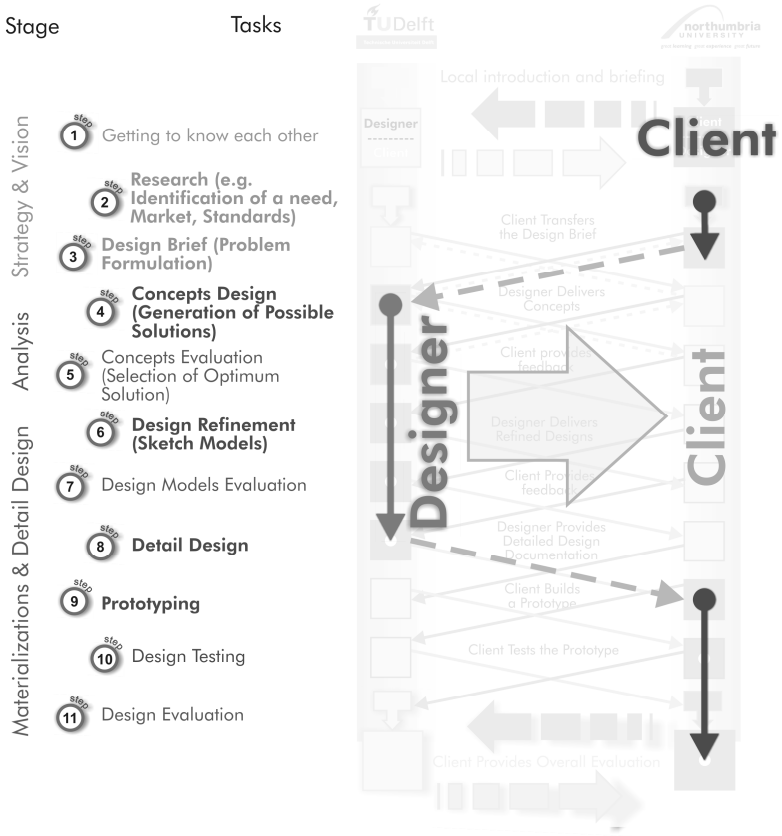

Fig. 1 Structure of the Globally Distributed Design Studio

The above named design outcomes were uploaded to a joint website and then discussed using asynchronous and synchronous media. The client group writes a brief, on the basis of which the designer group then produces a design, which the client group in the end prototypes and tests. The designer and client roles were set-up to provide students with a clear project demarcation. The need to communicate with a client team was to stimulate students to explicate and critically reflect on their ideas and assumptions. Details about the development of the course can be found in [15]. The GDDS aimed to improve student skills in four areas:

1. experience in using distance communication and information/ knowledge transfer;
2. designer-client communication, such as writing of design briefs, communicating a design strategy to a client and giving feedback;
3. awareness of cultural issues and concepts;
4. using technical drawings as a means of distance communication resulting in a prototype.

This paper reports how the course was actually implemented and presents the findings of a mid-term course evaluation among staff and students on the first three of the aims (the prototyping occurred later in the year, which is beyond the scope of this paper).

2 COURSE IMPLEMENTATION

The GDDS was originally developed between Delft University of Technology (The Netherlands) and the University of Western Sydney. The move of one of the academics from Australia to the UK meant that the course had to be re-established at Northumbria University, Newcastle, and UWS was no longer a partner. Eventually, the course was set up at Northumbria as in collaboration with a second year course administered by the School of Computing, Engineering & Information Sciences rather than the School of Design. The skill level was therefore different from the Master students in Delft. Due to the low uptake in Delft where it was set up as an elective course, another partner had to be found at short notice. The School of Creative Industries at Napier University, Edinburgh (Scotland) joined, and four teams at Northumbria collaborated with Napier and the other four worked with two teams in Delft.

3 COURSE EVALUATION

For the purpose of a mid-term course evaluation, a questionnaire was developed. It consisted of 15 Likert scaled items on perceptions about the course in terms of the task and lectures, virtual communication, designer-client interaction and cultural awareness, as well as prompts to explain their answers and two open-ended questions. Staff involved in the course delivery were emailed a set of open-ended questions. All staff and 83% of the students (27 of 35 at Northumbria, 12 of 13 at Napier and 4 of 4 in Delft) responded.

The overall student evaluation of the course was very positive across all the three universities. The vast majority of students (93%) felt that the GDDS course had prepared them better than other courses for design collaboration across distance. Students saw the course as interesting, new, exiting, useful and motivating and they felt more confident in communicating their ideas. The majority of the students (86%) found the task (a kitchen timer) interesting, but some also commented that it was rather basic or not appropriate for exploring cultural differences.

3.1 Virtual collaboration and use of communication technologies

Information exchange and communication between the distributed client and designer student groups was primarily done via Wiki, a groupware web-based technology, which provided a common interface between the three universities. Wiki pages were used to support information sharing between the distributed client and designer teams. It provided these distributed teams as well as co-located team student members with access to information sharing and retrieval. This was supplemented by other IT technologies such as teleconferencing, videoconferencing and e-mail.

The vast majority of the students (90%) found the Wiki pages very useful for asynchronous communication and updates and they largely replaced emails as it was hoped. Students liked that they were allowed to create their own group Wiki pages. They also commented that this provided them with an opportunity to creatively share their work and project progress amongst the collocated group members. They appreciated flexible access to information facilitated by the Wikis. There was only minor critique about usability, its layout and the fact that the pages were not protected. Student comments indicated that they found it useful to view work of the other student groups stored on the Wiki pages. They have indicated that this has allowed them to compare their own work with the work of the other students, which has facilitated their reflective practice.

Teleconferencing and videoconferencing communication technologies were used to facilitate synchronous virtual meetings between the distributed teams at the key hand-

over stages of the design project. Between TU Delft and Northumbria access to videoconferencing facilities was available while student groups working between Napier and Northumbria used teleconferencing technology. The students who used the videoconferencing technology perceived it to be very useful (81%), and welcomed it as new and exciting. On the other hand students who used teleconferencing saw this as less suitable.
The average for improved writing skills was 2.8 (neutral); some felt they had improved but others pointed out that the written component had not been large or felt they had no need to improve. If this component were to be a core learning objective, it would need more attention in the future.

3.2 Experience of designer-client interaction

The majority of students indicated that they were excited to have a client and also by taking on the role of a client, and that they found the dual role a motivating challenge. As part of interacting with a client team in another university, the students were asked to write a design brief, provide feedback on the one they received on the Wiki pages, present design concepts, and discuss the brief and the concepts each in a video or teleconference. These tasks were evaluated as reasonably successful receiving an average score of 3.9 to 4.1 out of 5. The majority also felt more confident in client communication although some qualified this by saying they still did not feel confident to deal with a "real" client.

3.3 Cultural awareness

The objective to raise cultural awareness took on a different form than originally intended. The geographical and cultural distance between the UK and the Netherlands and particularly between Scotland and England was not as big as it would have been for Australia. The average response for increased skills was neutral. However some of the responses from the Northumbria students working with Delft showed that the awareness had increased, stating for example that it had been harder than expected to describe the local people, or that they had become more aware of communicating in English with non-native speakers. As the Delft students were all international rather than Dutch, they faced an additional challenge in communicating requirements for a market they only knew as outsiders.

4 TEACHER REFLECTIONS

The teacher comments were largely positive about the opportunity to work with colleagues abroad and to see how students in other institutions approach their work. The more cautious comments related to the relatively high workload for a small group of students and the difficulties arising from different time schedules and skill level of students. The collaboration across the three universities also meant teaching and marking practices had to be more aligned and lecturers had to spent more time on preparation and discussion.

5 DISCUSSION

The results suggest that the implementation of the Globally Distributed Design Studio course was successful in facilitating student learning especially in the intended areas of virtual teamwork and communication between distributed client and designer teams. Overall the evaluation showed a combined effect of cultural and geographical distance and the communication technology being used (see figure 2).

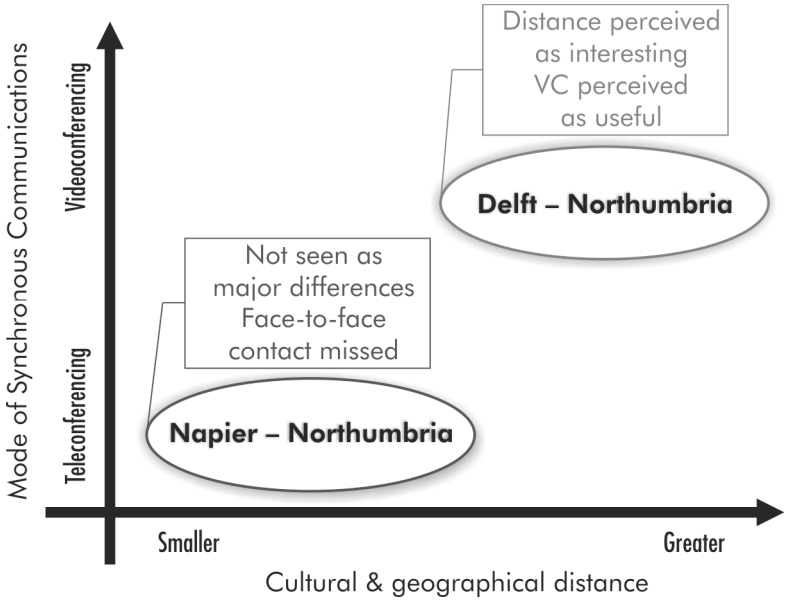

Fig. 2 Evaluation of collaboration as a function of distance and technology used

The setting became more plausible if the geographical distance required virtual communication and if videoconferencing was available, and face-to-face meetings were not missed. The dual role of client and designer was seen as a motivating challenge, even where the course was compulsory, which should be an encouraging sign to make such course more broadly available.

Acknowledgements
The authors gratefully acknowledge the participation of the students at the three universities. They would like to also thank to Ian Thompson and Paul Redhead from the Centre for Design Research at Northumbria University, who have kindly provided their time on the project, and input of ideas from Kerry Harman at OVAL Research Centre, University of Technology Sydney.

REFERENCES

[1] Freeze, K.J. *Digital Equipment Corporation: The VT320 Video Text Terminal*. (Design Management Institute Press, Boston, MA, US, 1991).
[2] Hoppe, R. The Global Toothbrush: International Division of Labor. *Spiegel: Special International Edition, The New World*, 2005(7), pp. 130-135.
[3] Vasilash, G.S. Daniel Sims: Designing Mitsubishis. *Automotive & Design Production*, 2006, November, pp. 34-36.
[4] Hoegl, M., Ernst, H. and Proserpio, L. How teamwork matters more as team member dispersion increases. *Journal of Product Innovation Management*, 2007, 24, 156-165.
[5] Leenders, R.T.A.J., van Engelen, J.M.L. and Kratzer, J. Virtuality, communication, and new product team creativity: a social network perspective. *Journal of Engineering and Technology Management*, 2003, 20, 69-92.
[6] Zakaria, N., Amelinckx, A. and Wilemon, D. Working Together Apart? Building a Knowledge-Sharing Culture for Global Virtual Teams. *Creativity and Innovation Management*, 2004, 13(1), 15-29.
[7] Gongla, P. and Rizzuto, C.R. Evolving communities of practice: IBM Global Services experience. *IBM Systems Journal*, 2001, 40(4), 842-862.
[8] Bohemia, E. Working Collaboratively in Today's Global Environment: a Global Product Development Course? In Lloyd, P., Roozenburg, N., McMahon, C. and Brodhurst, L., eds. *Changing Face of Design Education: 2nd International Engineering and Product Design*

Educational Conference, pp. 541-547 (TU Delft, Delft University of Technology, Holland, 2004).
[9] Kvana, T. and Candy. Designing collaborative environments for strategic knowledge in design. *Knowledge Based Systems*, 2000, 13, 429-438.
[10] Altenkirch, R., Aung, W., Cruz, B.C., Garside, J., Hinrichs, R., Johnson, W., Nieto, J., Roubicek, V., Thomas, G., Velez-Arocho, J., Wei, C.-H. and Zielinski, W. What We Must Do Together to Increase Quality and Productivity. In Aung, W., Hoffmann, M.H.W., Jern, N.W., King, R.W. and Ruiz , L.M.S., eds. *Innovations 2003: World Innovations in Engineering Education and Research*, pp. 1-12 (Begell House Publishing, Arlington, VA, 2003).
[11] Jänsch, J. and Birkhofer, H. Communication between Individuals - Its typology and support. In Marjanovic, D., ed. *8th International Design Conference DESIGN 2004* (Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb, The Design Society, Glasgow, Dubrovnik, 2004).
[12] Horváth, I., Duhovnik, J. and Xirouchakis, P. Learning the methods and the skills of global product realization in an academic virtual enterprise. *European Journal of Engineering Education*, 2003, 28(1), 83-102.
[13] Elspass, W. and Hollinger, C. Design education via collaboration in advanced knowledge environment. *Changing Face of Design Education: 2nd International Engineering and Product Design Educational Conference*, pp. 483-490, Delft University of Technology, 2004).
[14] Grierson, H., Ion, W. and Juster, N. Project Memories: Documentation and Much More for Global Team Design. In Rothbucher, B., Kolar, M., Ion, B. and Clarke, A., eds. *4th Engineering and Product Design Education: Educating Designers in a Global Context?*, pp. 397-402 (Hadleys Ltd, Salzburg, Austria, 2006).
[15] Bohemia, E., Lauche, K., Langeveld, L. and Badke-Schaub, P. Designing Distributed Design Studio. In Rothbucher, B., Kolar, M., Ion, B. and Clarke, A., eds. *4th Engineering and Product Design Education: Educating Designers in a Global Context?*, pp. 127-132 (Hadleys Ltd, Salzburg, Austria, 2006).
[16] Wodehouse, A., Grierson, H., Ion, B.J., Juster, N., Lynn, A. and Stone, A.L. TikiWiki: A Tool to Support Engineering Design Student in Concept Generation. In Lloyd, P., Roozenburg, N., McMahon, C. and Brodhurst, L., eds. *Changing Face of Design Education: 2nd International Engineering and Product Design Educational Conference*, pp. 449-456 (TU Delft, Delft University of Technology, Holland, 2004).
[17] Grierson, H., Wodehouse, A., Breslin, C., Ion, W. and Juster, N. Building a Design Engineering Digital Library: The Workflow Issues. In Rothbucher, B., Kolar, M., Ion, B. and Clarke, A., eds. *4th Engineering and Product Design Education: Educating Designers in a Global Context?*, pp. 373-378 (Hadleys Ltd, Salzburg, Austria, 2006).
[18] Grierson, H., Wodehouse, A., Ion, W. and Juster, N. Supporting Reflection and Problem-Based Learning Through the Use of Laulima. In Rodgers, P., Brodhurst, L. and Hepburn, D., eds. *3rd Engineering & Product Design Education International Conference: Crossing Design Boundaries*, pp. 551-556 (Taylor & Francis/Balkema, Napier University, Edinburgh, Scotland, 2005).

[1]Dr Kristina LAUCHE
Delft University of Technology
Faculty of Industrial Design Engineering
Landbergstraat 15
2628 CE Delft
The Netherlands
k.lauche@tudelft.nl
+31 15 278 9054

[2] Dr Erik BOHEMIA
Northumbria University
School of Design
Squires Building, Sandyford Road
Newcastle upon Tyne, NE1 8ST
United Kingdom
erik.bohemia@northumbria.ac.uk
+44 191 243 7724