Teaching Human-Centered Design Innovation Across Engineering, Humanities and Social Sciences

Lora Oehlberg[1], Ian Leighton[1], Alice Agogino[1] and Björn Hartmann[2]
[1]Department of Mechanical Engineering
[2]Department of Electrical Engineering & Computer Sciences
University of California, Berkeley
Berkeley, CA 94708
Email: lora@berkeley.edu, l8on@berkeley.edu, agogino@berkeley.edu,
bjoern@eecs.berkeley.edu

Abstract

Tomorrow's engineers must be able to work effectively in multidisciplinary teams. In response to this challenge, universities are broadening engineering design curricula. This paper describes two educational programs at the University of California, Berkeley, which engage undergraduates from multiple disciplines in design education: 1. {design.}, a student-initiated course on the basic human-centered design process and philosophy; and 2. the Human-Centered Design Course Thread, a certificate program in which students take multiple courses across departments that are thematically linked to human-centered design. We present the organization and management of these programs along with descriptive statistics on student participation. We also explore the impacts these programs have had on participating students' multidisciplinary design education, particularly: pursuing design as a career, participating in the multidisciplinary design community, and broadening perspectives of design.

I. Introduction

Many reports emphasize the increasingly multidisciplinary nature of engineers' work, and the need for universities to train young engineers to work effectively with other disciplines (e.g., [1, 2, 3]). Industry demands engineers who are experienced in collaborating with other fields; innovation is often sparked by the intersection of multiple disciplines [4, 5].

To meet this need, some academic institutions have integrated multidisciplinary design into the engineering undergraduate curricula. For example, Howard University has implemented a multidisciplinary initiative in the Mechanical Engineering department's capstone course, drawing together faculty and students from mechanical engineering, marketing, and fine arts [6, 7]. Purdue's Engineering Projects in Community Service (EPICS) program is also built on multidisciplinary student teams [8, 9]. The University of Michigan currently offers a minor in Multi-disciplinary Design for undergraduate engineering students [10], which requires that students participate in peer mentoring for leadership and complete both multi-term projects and a cornerstone design course.

Many graduate programs have project-based courses teams with students from engineering, product design, and business administration to collaborate on product development projects. Examples of these programs include the University of California

1

(UC) at Berkeley's New Product Development course with the California College of Arts [11], MIT's joint program with the Rhode Island School of Design (RISD) [12], and Carnegie Mellon University's Integrated Product Development course [13]. A previous study evaluating the UC Berkeley course found that alumni from their graduate course found these learning experiences in multidisciplinary teams quite valuable to their later careers in industry [14].

Although these programs integrate engineering, business and industrial design, there are fewer examples that additionally include the humanities and social sciences. Human-centered design can particularly benefit from the critical perspectives and research methodologies that humanities and social science students bring. It is possible that these programs are rare because it is difficult to advertise and draw students to such opportunities, or to incentivize faculty to collaborate across seemingly distant disciplinary boundaries. This paper describes two recent efforts at UC Berkeley to engage these varied disciplines in our undergraduate design education:

- **{design.}**, a student-initiated course on human-centered design process and philosophy.

- **Human-Centered Design Course Thread**, an undergraduate certificate program that links courses connected to the theme of human-centered design, administered through the Townsend Center of the Humanities.

This paper explores the impact of these multidisciplinary design programs at UC Berkeley that include a wide range of disciplines – not only engineering, business and industrial design, but also the humanities and social sciences – in innovation education. We examine each program's benefit to students' learning through evaluation surveys and student interviews. We also highlight three themes that emerged from our surveys and interviews: pursuing design as a career, participating in the multidisciplinary design community, and broadening perspectives of design. Finally, we reflect on how engineering and non-engineering students and faculty collectively contribute to the students' understanding of design innovation.

II. Case Study: "{design.}", a Student-Initiated Course

{design.} is a student-initiated course offered through the Democratic Education at Cal (DeCal) program [15]. DeCal offers pass/no-pass courses that are student facilitated and faculty sponsored; student facilitators handle the day-to-day operations of the course, and faculty members sponsor the course and provide oversight. {design.} is sponsored by one of the faculty co-authors and facilitated by engineering and non-engineering members of *Berkeley Innovation*, a student human-centered design club at UC Berkeley.

Berkeley Innovation was founded in 2003 and is composed primarily of undergraduate students, coming from a wide range of disciplines, including Mechanical Engineering, Computer Science, Integrative Biology, Business, Architecture, English, and Rhetoric. While the club primarily focuses on extra-curricular design projects, members of *Berkeley Innovation* initiated the {design.} course in Fall 2009 to train and recruit potential new members of the club. It has been offered for four consecutive semesters since then.

Two primary learning goals of the course are to teach students about 1) human-centered design principles and philosophy, and 2) the role of human-centered design in the development of products, buildings, software, and services. Complementary goals are to increase visibility of the human-centered design community at UC Berkeley and encourage a wider range of students to participate in activities like *Berkeley Innovation*. The course introduces students to ideas from leading experts in design outside of Berkeley by including articles from *Ambidextrous Magazine* [16] and online videos from the Technology Entertainment Design or "TED" conference [17].

Figure 1: Photograph of the {design.} DeCal, during an in-class design activity.

{design.} is intended to be lightweight, yet still giving a complete overview of human-centered design. The course meets once a week for two hours. Students earn two units, which do not count towards degree requirements. Weekly topics of discussion include: the role of design and designers, "good" design, design process, critical design skills (sketching, prototyping, brainstorming), failure and ambiguity, the changing nature of design, sustainability, and humanitarian design. Along with in-class activities, students also complete two short, four- and six-week design projects. The first project is completed in groups on a given topic or theme, while the second project is completed individually or in teams, on a topic of the students' choice. The first project usually results in a low-fidelity prototype of the idea, while the second project additionally focuses on user testing and refinement of the prototype. Both projects are done with guidance from the facilitators, with more structured deliverables for the first.

Table 1 lists the demographic makeup of the course over the past four semesters. Given the small number of women in engineering and industrial design (usually under 25%),

of particular interest is the high number of women taking the course: near or over 50% in all semesters.

Table 1:Enrollment demographics of the {design.} DeCal (Fall 2009 - Spring 2011).

	Fall 2009	Spring 2010	Fall 2010	Spring 2011
All Students	28	24	39	30
Undergraduates	25	23	36	26
Freshman	6	6	17	8
Sophomore	2	7	5	7
Junior	10	2	7	4
Senior	7	8	9	10
Graduate	3	1	1	1
Male	12	13	20	8
Female	16	11	19	22
College of Engineering	8	7	9	7
College of Environmental Design	4	4	3	2
College of Letters & Sciences	12	10	22	21

III. Impact: "{design.}", a Student-Initiated Course

To assess the impact of the {design.} DeCal course, the instructors conducted surveys at the beginning, middle, and end of the semester asking students to evaluate the course effectiveness and reflect on their perspectives on design. The surveys included questions on students' learning expectations, why they were interested in the course, how they would describe the course to a friend, who they would recommend it to, advice they would give to students considering taking the course, and planned involvement with design in the future. By qualitatively looking at the open-ended comments students left in the final surveys from Fall 2009 – Fall 2010, we found three prominent themes as benefits of the course: learning more about how to pursue design as a career; participating in the multidisciplinary design community at UC Berkeley; and broadening students' initial perspectives of design.

Pursuing Design as a Career

The most prominent value attributed to {design.} was that it taught students about different domains of design that they had not previously considered. Of the 50 students who took the final course survey between Fall 2009 and Fall 2010, 14 mentioned career aspirations, often in response to the question "Do you plan on pursuing design beyond this course?".

> *"I learned a lot about how the design process works and the different theories behind design. I also became more aware of the different job markets that are open to designers and became informed of how to better present myself as a designer."* (Female, Junior, Architecture, College of Environmental Design)

Others identified how the human-centered design approach might apply to their particular discipline.

> *"I really enjoyed learning about the design process. Even though the course seemed to be focused on product design, the design process applies to a much more diverse set of fields. I honestly think that I will be using some of these techniques in my work as a computer scientist."* (Male, Junior, Electrical Engineering and Computer Science, College of Engineering)

Participating in the Multidisciplinary Design Community

While learning about design theory and the design process was important, students also valued the opportunity to become more familiar with their local design community. Of the 50 students who took the final survey between Fall 2009 and Fall 2010, eight specifically mentioned the benefits of being part of a broader design community in their comments.

> *"I got a general feel for the design process, and I think more importantly learned about the design community at Berkeley."* (Male, Freshman, College of Natural Resources)

The course also led students to seek further education in design. When asked "Do you plan on pursuing design beyond this DeCal", one student responded:

> *"Yes, I'm in Berkeley Innovation, I am working as a user interface designer on a research team called [Research Project Name]. And I am a web interface designer in Innovative Design [graphic design student club]. I am also signed up for the design course thread and plan on doing anything else that I can find that has to do with design."* (Male, Freshman, Electrical Engineering & Computer Science, College of Engineering)

This student's enthusiasm not only drew him to the {design.} DeCal, but also other avenues for design available to him on campus. In taking this course, students were not only introduced to *Berkeley Innovation*, but other disciplines that include design.

Broadening Perspectives of Design

Ultimately, the goal of the course was to teach students about the larger world of human-centered design. Students mentioned that they had gained a new sense of what design was and also highlighted the value of working with a diverse range of students.

> *"Definitely an introduction and exposure to the design process and different styles and paradigms that designers work with."* (Male, Freshman, Electrical Engineering & Computer Science, College of Engineering)

> *"I learned about the design process and how important it is to consider the user throughout the entire process. I expanded on my idea of what design was and learned what human-centered design is about."* (Female, Freshman, Electrical Engineering & Computer Science, College Of Engineering)

In some cases, {design.} challenged students' assumptions on what is valued in a design processes.

> *"I feel like I learned a lot in this class. There's way more to designing than just having a solution or invention right away!"* (Female, Freshman, Economics, College of Letters & Sciences)

This also included introducing students who had a disciplinary perspective of design to new ways of thinking about design from a broader perspective.

> *"A bigger picture of 'design', as I initially understood only in architecture context."*
> (Male, Junior, Architecture, College of Environmental Design)

That said, students from disciplines that do not necessarily teach design also found a benefit in learning about creativity and the design process.

> *"Even if you're not an engineer or architect, there's still much you can learn from this DeCal that you can apply to everyday life. This DeCal has definitely improved my problem solving skills by helping me think out of the box for creative solutions.*"
> (Female, Junior, Integrative Biology, College of Letters & Sciences).

IV. Case Study: Human-Centered Design Course Thread

Partially motivated by the early success of {design.}, the "Course Thread" in Human-Centered design formalizes participation in multidisciplinary education. Course Threads are certificate programs that enable students to focus on exploring themes that connect courses in different disciplines across the university. The program is administered by the Townsend Center for the Humanities [18]. The Human-Centered Design Course Thread started in the Fall 2010 semester; five other Threads currently exist. Course Threads, by design, focuses on connecting already established courses:

> *"Without creating new majors or minors, the program instead highlights connections between existing courses. Course Threads help students see the value in educational breadth while also pursuing a more in-depth and well-rounded knowledge on one particular topic"* [18].

The Human-Centered Design (HCD) Course Thread is similar to an interdisciplinary minor, enabling students to receive recognition for taking courses across disciplines relevant to human-centered design. Students are required to take three courses from a set list created by faculty member sponsors. To receive their certificate, students must also participate in a symposium and discuss how the courses they took relate to the HCD Course Thread theme. While the Course Thread is not listed on the official university transcripts, students can list the certificate on their resume.

This section reports enrollment statistics from the HCD Course Thread, as well as interviews with students working towards certificates. Twenty-nine UC Berkeley undergraduates are currently enrolled in the program. The gender of the participants in the HCD Course Thread is relatively evenly split (13 men, 15 women). As the program is new, only one student has completed the requirements thus far; three additional students are expected to finish in May 2011.

Table 2 shows the distribution of the academic standing and expected graduation term of students enrolled in the course thread program, as reported when the student first enrolled. While the Townsend Center for the Humanities advertises the Course Threads to all students, they focus on targeting first- and second-year students, as younger students will have more time to shape their course selections based on their Course

Thread. However, after the launch many juniors and seniors interested in design also signed up for the Course Thread. We hypothesize that these students found that they had already completed many of the course requirements before the Course Thread program was first offered. Their enrollment provides some support that the list of courses chosen by faculty matches courses chosen by students who independently sought an interdisciplinary design education.

Table 3 shows the distribution of disciplines represented in the course thread. Five students have elected to track the courses they have taken on the HCD Course Thread web site. These courses (from among the broader list of courses) are also listed in Table 3. While the Course Thread program is run out by a center in the Humanities, a large number of students participating in the HCD Course Thread come from the College of Engineering. The courses listed in the thread connect across the College of Engineering, College of Letters & Sciences, and the College of Environmental Design.

Table 2: Academic Standing and Expected Graduation Term, as of students' initial enrollment in the HCD Course Thread program.

Academic Standing		Expected Graduation Term	
Seniors	10	Spring 2010	1
Juniors	9	Fall 2010	1
Sophomores	3	Spring 2011	6
Freshmen	7	Fall 2012	2
		Spring 2012	8
		Summer 2012	1
		Fall 2012	0
		Spring 2013	5
		Fall 2013	0
		Spring 2014	5

Table 3: Majors of Course Thread Enrollees and Example HCD Course Thread Courses

Majors of Course Thread Enrollees	Example Course Thread Courses	

Engineering (10)
        Mechanical Engineering (7)
        Electrical Engineering & Computer
            Science (2)
        Industrial Engineering &
            Operations Research
Business Administration
Letters & Sciences (19)
        Computer Science (3)
        Cognitive Science (3)
        Molecular & Cell Biology
        Humanities (12)
                English
                Philosophy
                Psychology
	Art Practice	Foundations of American Cyber-
		        Culture
		Game Design Methods
		Special Topics in New Media

	Cognitive Science	The Mind and Language
	Computer Science	User Interface Design and Development
	Education	Introduction to Cognitive Science
	Environmental Design	Introduction to Architectural Design Theory and Criticism
	History of Art	Reading and Writing about Visual Experience

Social Welfare	
American Studies	
Urban Studies	
Anthropology	
Economics	
German	
Media Studies (3)	
Interdisciplinary Studies	
Environmental Economics & Policy	

Interdepartmental Studies	Information Technology and Society
Mechanical Engineering	Introduction to New Product Development
Psychology	Computational Modes of Cognition
Sociology	Introduction to Sociological Methods

V. Impact: Human-Centered Design Course Thread

As the HCD Course Thread is a relatively new program, we have limited evaluation data. We interviewed four students: one male senior majoring in Computer Science, one female junior double-majoring in Cognitive Science and Computer Science, one female freshman majoring in Electrical Engineering and Computer Science, and one male freshman double-majoring in Cognitive Science and Computer Science. We additionally contacted some faculty members who teach HCD Course Thread courses for their perspective on the addition of Course Thread students. These interviews brought to light several of the student benefits of the HCD Course Thread: augmenting education with interest-relevant courses; participating in the multidisciplinary design community; supporting design career ambitions; and learning to design from a multidisciplinary perspective.

Pursuing Design as a Career

Interviewees regarded the Course Thread as particularly useful for their long-term professional ambitions. All of the students we interviewed planned on listing the completion of the Course Thread certificate on their resume. They also considered the Course Thread as more relevant to a career path in design than other courses:

> "… I feel like the Course Thread classes are actually more pertinent to what I want to be doing when I graduate, what I hope to be doing. Whereas [Cognitive Science], [Computer Science], they're kind of abstractly applicable, but I mean, I do Computer Science because it's a good thing to know, and like [Cognitive Science] is kind of the closest thing you get [to design] at Berkeley. But the Course Threads, the classes there are the ones that pertain the most to what I want to be doing, I just want to take as many as possible." (Male, Freshman, Cognitive Science & Computer Science)

Despite the recognition through the certificate, many of the students interviewed expressed concern that the Course Thread program would not be taken seriously due to of a lack of rigor — only requiring three courses as opposed to the more extensive requirements of pursuing a full minor (typically 5 courses).

Participating in the Multidisciplinary Design Community

HCD Course Thread students noted that they benefitted from the opportunity to meet with others who shared similar interests in Human-Centered Design but came from other disciplinary backgrounds. When asked about the benefits of the HCD Course Thread program, one student stated:

> *"… also, just meeting other people who are doing the course thread, and other people from different majors doing these courses that are in the Human-Centered Design thread."* (Female, Junior, Cognitive Science & Computer Science)

Many of the students' suggestions to improve the Course Thread program included leveraging social networking platforms, such as Facebook – enabling Course Thread students to recommend the program to their friends, find out who they knew who was also in the Course Thread program, and have a forum to discuss the Human-Centered Design theme.

Broadening Perspectives of Design

A third principal for the students currently enrolled in the course thread is the ability to find other relevant courses.

> *"Well, I've gotten more exposure to other classes I'm interested in. So, even though I've completed all the course thread requirements I'll probably look at some of the other ones in the Human-Centered Design thread for my senior year. Because I'm always looking for fun classes to take, and it's hard to find through [the university course scheduling website]."* (Female, Junior, Cognitive Science & Computer Science)

The students also liked the idea of having more guidance beyond the course thread list: highlighting sub-themes within the course thread, or having students who have completed the course thread help make recommendations on which classes go particularly well together.

By exposing students to other disciplines' perspectives of design, students have a broader appreciation of others' viewpoints and can further refine their own perspective of design. One student considered how his understanding of the topic of human-centered design had changed:

> *"From an engineer's standpoint, it's easy to design a project around the capabilities of one's set of tools. My courses in human centered design taught me that the primary factor of design is the needs of the people using the project. This was the lesson that I learned in day one, and everything after that was either learning or practicing formal methodologies of this philosophy."* (Male, Senior, Computer Science)

Ultimately, the Course Thread allows students to extend their expertise beyond their disciplinary and apply these broader skills to a multidisciplinary team. One student reflected on this as the most valuable aspect of his participation in the Course Thread program:

> *"I believe that my experiences in the course thread program have given me a competitive advantage as a working software engineer. IDEO's CEO Tim Brown has described an individual with expertise and breadth as a t-shaped individual, where the top of the T is a wide base of topics they are familiar with, and the line running down the T is the depth of their experience in a specialized subject. The course thread program has widened my perspectives in understanding how people interact with the things I make at work. It augmented my education by providing the top of the T in my shape."* (Male, Senior, Computer Science)

Faculty involved in the HCD Course Thread program also see the value of improving the pedagogy of the course for their mainstream students as well. Both engineering and

humanities faculty value the diverse disciplinary expertise that students in the HCD Course Thread bring to class discussions and team projects. One faculty member in Art Practice summarizes the perspective of a non-engineering faculty member.

> *"In humanities classes with high-tech projects, engineering students are sharing their expertise and confidence in programming with humanities students who share their expertise and confidence in creative authorship and design. They have more mutual respect for each other than one might think, given how separate their respective academic cultures sometimes pretend to be. The respect is a direct function of instructors telling students that both sets of skills are required to achieve course goals, and, by extension, societal goals of creating cultures and technologies that benefit all participants. It also helps to show how science has as much in common with art and engineering has more in common with design than art with design and science with engineering."*

By offering a simple incentive for students who are interested in design to take courses that fit along this theme, the Course Thread enables students to express their interest more fully, explore career options, and join the multidisciplinary design community on campus. The program provides just enough structure for students to further their education on their own, augmenting their disciplinary expertise with an appreciation for how multiple disciplines might apply to the design domain.

VI. Conclusion

These two case studies illustrate two examples of ways that educators can engage multiple disciplines in undergraduate design education. Multidisciplinary design education allows students to interact with each other, both professionally and socially, and become more familiar with other disciplines' ways of thinking about design. We found three main benefits of offering multidisciplinary design opportunities to our students:

- **Learning about Pursuing Design as a Career.** Students have an opportunity to learn more about careers in design that build upon their disciplinary expertise. Even if the student does not choose a design-oriented career, they can still begin to think about how to apply design process and design practice to their future professions.

- **Participating in the multidisciplinary design community.** By becoming involved in student-initiated courses or certificate programs, students can actively engage in the multidisciplinary conversation about design on campus and in the community.

- **Broadening Perspectives of Design.** While students are taking courses in their major to gain a depth of expertise in a given discipline, multidisciplinary design experiences help them "cross the T" and become familiar with a breadth of subjects. This will help them better communicate with their collaborators from multiple disciplines later in their careers as designers or engineers.

VII.   Acknowledgements

Course Thread for their inspiration and help with this research. We would also like to thank the Berkeley Institute of Design for their support of this research.

VIII. References

1. National Academy of Engineering. *The Engineer of 2020: Visions of Engineering in the New Century*. National Academies Press, 2004.

2. National Academy of Engineering. *Educating the Engineer of 2020: Adapting Education to the New Century*. National Academies Press, 2005.

3. Sheppard, S.D., K. Macatangay, A. Colby, W. M. Sullivan, L. S. Shulman, *Educating Engineers: Designing for the Future of the Field*, Jossey-Bass, 2008.

4. Hargadon, A. *How Breakthroughs Happen: The Surprising Truth About How Companies Innovate*. Boston: Harvard Business School Press, 2003.

5. Denison, D.R. and J.A. Kahn. "From chimneys to cross-functional teams: developing and validating a diagnostic model". *Academy of Management Journal*, (1996) Vol. 39, pp. 1005-1023.

6. Lewis Thigpen, Emmanuel Glakpe, Gerald Gomes, Terrence McCloud. "A Model for Teaching Multidisciplinary Capstone Design in Mechanical Engineering." FIE 2004.

7. Emmanuel Glapke, Horace Whitworth, Lewis Thigpen. "The Evolution of the Capstone Design Course in the Mechanical Engineering Curriculum at Howard University." International Conference on Engineering Education (ICEE) 2010

8. Gregory Bucks, William Oakes, Carla Zoltowski, Frank DeRego, Silvia Mah. "Facilitating Multidisciplinary Teams in a Service Learning Environment". ASEE 2007.

9. Edward J. Coyle, Leah H. Jamieson, William C. Oakes. "EPICS: Engineering Projects in Community Service" *International Journal of Engineering Education*, Vol. 21, No. 1, 2005.

10. University of Michigan, Multidisciplinary Design Program. http://www.engin.umich.edu/minors/multidisciplinarydesign/. Accessed 30 January 2011.

11. ME 290P: Managing the New Product Development Process. University of California, Berkeley. http://best.berkeley.edu/~aagogino/me290p/me290p.html. Accessed 30 January 2011.

12. Eppinger, S.D. and M.S. Kressy, "Interdisciplinary Product Development Education at MIT and RISD," *Design Management Journal*, Summer 2002, pp. 58-61.

13. Integrated Product Development, Carnegie Mellon University. http://www.andrew.cmu.edu/org/IDIG/courses.htm. Accessed 30 January 2011.

14. Cobb, C., A.M. Agogino, S. Beckman. "Longitudinal Study of Learning Outcomes in a New Product Development Course." ASME DETC 2007.

15. Democratic Education at Cal. http://www.decal.org. Accessed 30 January 2011.

16. *Ambidextrous Magazine*. http://www.ambidextrousmag.org. Accessed 20 April 2011.

17. TED Conference. http://www.ted.com. Accessed 30 January 2011.

18. UC Berkeley Townsend Center for the Humanities, Human-Centered Design Course Thread.   http://coursethreads.berkeley.edu/course-threads/human-centered-design. Accessed 30 January 2011.

VIII. Authors' biographies

Lora Oehlberg is a PhD candidate in the Department of Mechanical Engineering at the University of California at Berkeley. She is also a member of the Berkeley Institute of Design, a multidisciplinary research lab. She received a M.S. in Mechanical Engineering from the University of California at Berkeley (2008) and a B.S. in Mechanical Engineering from Stanford University (2006). Her doctoral research is on how designers use personal design information tool during collaborative new product development projects. Her background includes both corporate product design and development and human–computer interaction research.

Ian Leighton is an undergraduate student in the Department of Mechanical Engineering at the University of California at Berkeley. He is the student leader of *Berkeley Innovation*, an undergraduate human-centered design student group. He helped found the {design.} DeCal, and has taught it for all four semesters.

Alice Agogino is the Roscoe and Elizabeth Hughes Professor of Mechanical Engineering from the University of California at Berkeley. She served as Chair of the Faculty Senate; Associate Dean of Engineering; Faculty Assistant to the Executive Vice Chancellor and Provost in Educational Development and Technology; and Director for Synthesis, an NSF-sponsored coalition of eight universities with the goal of reforming undergraduate engineering education, and continues as PI for the EngineeringPathway project. Prof. Agogino received a B.S. in Mechanical Engineering from the University of New Mexico (1975), M.S. degree in Mechanical Engineering (1978) from the University of California at Berkeley and Ph.D. from the Department of Engineering-Economic Systems at Stanford University (1984). Prior to joining the faculty at UC Berkeley, she worked in industry for Dow Chemical, General Electric and SRI International.

Björn Hartmann is an Assistant Professor in the Department of Electrical Engineering and Computer Sciences at the University of California, Berkeley. His research in Human-Computer Interaction investigates authoring tools for designers and end-user programmers. His prototyping tools have been used at companies such as Nokia, Leapfrog, IDEO, and Frog design. He received degrees in Communication, Digital Media Design, and Computer and Information Science from the University of Pennsylvania in 2002, and a PhD in Computer Science from Stanford University in 2009. He is a recipient Best Paper Awards and Nominations at UIST and CHI in 2006,2007,2008,2010,2011. Björn was Editor-in-Chief of Ambidextrous magazine, Stanford's Journal of Design, and had a successful career as an electronic musician and record label owner.

Address: Berkeley Institute of Design, University of California at Berkeley, Berkeley, California, 94720; telephone: 510-642-1191; email: lora@berkeley.edu.