
Interaction Design in the University: Designing Disciplinary Interactions

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Abstract

Interaction design (ID) as a field emerged in the late 1990s with roots in both the HCI and design communities. We ask whether the 'interdisciplinary' agenda of the 3rd paradigm of HCI can be accommodated in the traditional disciplined university. An alternate model of 'interdisciplinarity' offers one way forward, but calls for clarity on the question of what interaction design aspires to be. We offer the notion of 'disciplined transdisciplinarity' as an exciting and perhaps necessary way of solving the complex problems that ID researchers face, and illustrate this with examples drawn from the area of emotional design and assessment. Our bridge between 3rd paradigm, knowledge production and what we are calling 'disciplined transdisciplinarity' yields insights into the path toward institutionalizing and legitimating research on ID and academic careers in this field in the university.

Keywords

Interaction design, paradigms, interdisciplinarity, multidisciplinarity, transdisciplinarity, institutionalization, university, tenure and promotion

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General Terms

Design, Management, Theory

Introduction

In the Three Paradigms of HCI, Harrison et al argue that two major intellectual waves have informed the field: the first from engineering and human factors and the second from cognitive science. A 3rd paradigm, which they call the 'phenomenological matrix', is heralded as the latest wave of HCI research and draws on intellectual traditions and ways of knowing from the humanities and social sciences. "The 3rd paradigm sees knowledge as arising and becoming meaningful in specific situations, it has a greater appreciation for detailed, rich descriptions of specific situations." [11, p. 14].

The recent report, *Being Human* [10] describes a similar trajectory. Here too the authors describe the origins of HCI in human factors engineering, with the addition of cognitive science in the 1980s that builds on, and importantly, does not displace, the earlier tradition [10, p. 84-87]. In the 1990s, with a turn first toward human interaction with computers and later computer-mediated interaction among people, the area attracted more socially oriented researchers. By the mid-1990s attention to 'interaction' brought the growing realization "that design as a set of related practices in its own right, should also become an important part of HCI" [8, p. 86] and attention to cultural, emotional and aesthetics were also required. In this way "notions of *interaction design* in HCI comes to the fore" [10, p. 86].

We suggest that this movement is not surprising or even unexpected, but rather that "at each stage in the

process of exploring the interactions between human beings and machines, there has eventually arisen the need to move beyond the expected boundaries of the issue into a larger circle of implications. This has drawn researchers further and further into the explorations of the complexities of the human dimension of in order to wrestle with what seemed at the outset to be reasonably straightforward technical problems" [13, p. 3].

It is difficult if not impossible to broach these wicked problems from the perspective of only one discipline; the challenge is how to interact, engage and collaborate with researchers from different disciplines. The authors of *Being Human* recognise this, and one of their recommendations is that HCI needs to "develop disciplinary techniques that allow HCI to collaborate with other research communities" [10, p. 81]. It is the exploration of implications of doing research beyond disciplinary boundaries that motivates our paper. We take interaction design which has origins in at least two disciplines as our case, and the university as the institutional setting in which to explore both the nature of the potential disciplinary crossings and the institutional challenges such crossings may pose – not only for the institution, but for the acceptance of knowledge claims as legitimate, the development of future researchers, and the production of scholarly careers.

Interaction Design in the University

Interaction design as a field emerged in the late 1990s with roots in both the HCI and design communities. While there is still "no commonly agreed definition of interaction design, its core can be found in an orientation toward shaping digital artifacts – products,

services, and spaces – with particular attention paid to the qualities of the user experience” [7, p. 4].

Bill Verplank [18], a graphical user-interface designer with a technical background in engineering, notes that he first used the term in the late 80s in preference to user-centred design while working with Bill Moggridge, a British industrial designer and a founder IDEO. IDEO was one of the first design firms to integrate the design of software and hardware into the practice of industrial design. Fallman [7, p. 4] states that interaction design “recognizes itself as a design discipline” but acknowledges that groups may have their origins in a number of disciplines such as computer science, anthropology, or informatics as teams are generally multi-disciplinary. At the 1999 conference *Researching Design: Designing Research* Richard Buchanan elaborated on this from the perspective of design: “what I believe has changed in our understanding of the problem of design knowledge is greater recognition of the extent to which products are situated in the lives of individuals and in society and culture” [4, p. 14].

Similarly, in HCI as we saw in the previous section challenges to exclusively rationalist accounts had been appearing since the 1990s, and since 2003 the annual CHI conference has included sessions on design and on interaction design to which designers and social scientists as well as computer scientists have contributed. The 2007 paper by Harrison et al [11], based on a review of the literature published in the field, showed how HCI had broadened in its range of intellectual interests, to arrive at a stage where the concept of *interaction* was central. They provisionally called this stage the ‘phenomenological matrix’ and argue that while embodied interaction is not unique to

the 3rd paradigm, the 3rd paradigm extends it. “...what is central is a phenomenological viewpoint, in which all action, interaction, and knowledge is seen as embodied in situated human actors” [11, p. 7].

A definitive history of interaction design has yet to be written, and for our purpose we see interaction design as a current end product of a movement across history in which humans and human experience are increasingly viewed as central in the design of technical artifacts.

Today, there is an active and vital community of scholars and researchers engaged in interaction design in evidence at conferences such as CHI, DIS, UX and DRS. The community is diverse and includes researchers from a number of disciplines in the university as well as practitioners and researchers from industry. While the potential of the diversity to inform research on interaction design is recognised within this intellectual community, the challenge for those in the university is that it often does not often fit comfortably within traditional university departmental and faculty structures where discipline and department align. As well, the nature of the knowledge produced may not be considered valid or constitute a legitimate knowledge claim in the university department that manages the system for the distribution of rewards, including promotion and tenure.

Recently however, the potential and value of disciplinary crossings has been recognized by bodies such as the National Academies of Science and the U.S. Council of Graduate Schools. In a recent report the Council noted that “knowledge creation and innovation frequently occur at the interface of disciplines” [17, p.

18]. Universities need to find ways of accommodating what may be one of the most dynamic, flexible and responsive parts of the institution – groups whose practice is grounded in teamwork and collaboration, who are in touch with their disciplinary depths yet bridge these differences to connect with the broader community. One question is how the university as an institution can accommodate this engagement of disciplines and intellectual traditions in ways that make it possible for a field such as interaction design to evolve in the university? Another is how the participation of scholars – including students and pre-tenured faculty, from across a range of disciplines can be enabled? Fortunately, there are several decades of research on ‘interdisciplinarity’ to inform this challenge; and it is to this we now turn.

Knowledge Production in the University

‘Interdisciplinarity’ is the term most often used to describe activities in which individuals from two or more disciplines are engaged. Used this way the term not only masks what scholars generally agree constitutes this specific form of disciplinary crossing, but confines to the shadows other forms of disciplinary crossings that are fundamentally different [14]. Research is truly interdisciplinary when it is not just pasting two disciplines together to create one product but rather is an integration and synthesis of ideas and methods [6, p. 26-27]. True interdisciplinarity leads to increased specialization, even to the formation of a new discipline. As Barthes pointed out the goal is to create “a new object that belongs to no one” [1]. An example is biochemistry that emerged from the disciplines of biology and chemistry. Multidisciplinarity, on the other hand, is “research that involves more than a single discipline in which each discipline makes a separate contribution” [6, p. 27]. Here the goal is to

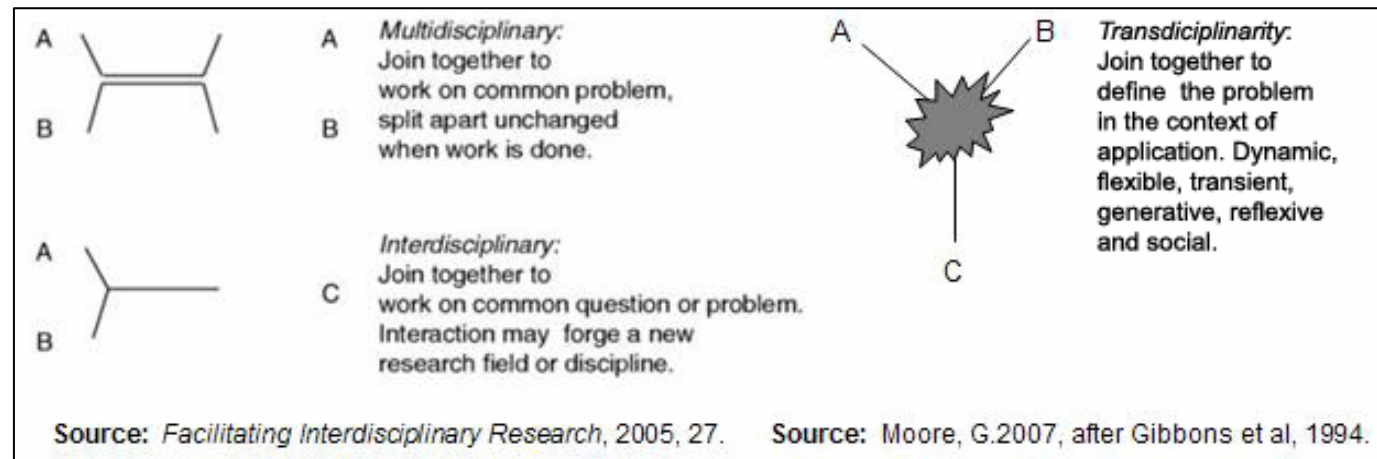


figure 1. Multi-, inter- and transdisciplinary.

explore complex and often systemic issues from multiple perspectives where each discipline is relatively “autonomous. The efforts are additive but not necessarily integrative” [6, p. 27]. For example, a project on climate change might bring together engineers and social scientists who approach the problem according to their disciplinary norms.

A third type of crossing – transdisciplinarity – is the most radical both in the nature of the practice and in its outputs. In transdisciplinarity the primary focus is not on the discipline per se but on the generative potential of the interaction of individuals from different disciplines working together in the context of a specific problem or application. Diversity matters. The context matters. Transdisciplinary collaboration transcends traditional disciplinary boundaries and may transform disciplinary identities to some degree. Here, “the point is not just application of given methodologies but also *implication*—a result of imagining entirely new possibilities for what disciplines can do” [2, p. 99]. Figure 1 above illustrates the three forms.

It is transdisciplinarity that most directly challenges established academic norms about the ways in which knowledge is produced in the university. Why is this the case?

Disciplines are the way in which scholarship has been organized and within each discipline there are accepted norms and values around the production of knowledge. In the modern university disciplinary and departmental boundaries are virtually synonymous, and as departments regulate, evaluate and discipline this production through the administration of rewards systems such as promotion and tenure, it can be

difficult to move outside. Harrison et al write explicitly about the challenges of getting 3rd paradigm work accepted in CHI, the pre-eminent conference in the field. These include the 1) legitimacy of only certain kinds of measures of success, 2) limited understanding of the validity of methods outside a limited canon and 3) insensitivity to important innovation [11, p. 11].

In *The New Production of Knowledge*, Michael Gibbons [9] and his collaborators set out to explore major changes in the way knowledge is being produced across the disciplines. The organizing principle is “that a new form of knowledge production is emerging alongside the traditional, familiar one” [9, p. vii]. The attributes of this new form of knowledge production that distinguish it from the traditional form are the recognition that knowledge is produced in the context of application that it is transdisciplinary, collaborative, heterogeneous in terms of the skills people bring to it, reflexive and aware of the broader context and social accountability, and with new criteria to assess the quality of the outcomes [9, p. 3-11]. While this thesis is not without its critics, including from its authors [15], nor is it entirely novel, their framing of the production of knowledge as a socially distributed knowledge production system in which knowledge is both supplied by and distributed to individuals and groups across the social spectrum [9, p. 14] resonated with the experience of many researchers. It also highlights the transdisciplinary nature of much contemporary problem solving and located the production of knowledge in part outside the university – a further challenge for the academy.

The question we raise is: As a form of ‘interdisciplinarity’ what does interaction design aspire

to be? The question is critical as the path toward institutionalizing and thereby legitimating the field will be different depending on the answer. Inter- and multi-disciplinarity are minimally disruptive as these forms largely reproduce the well- understood apparatus of knowledge production and do not require significant institutional reform to accommodate them as the participants continue within their disciplinary culture. It is the transdisciplinary approaches that present the greatest challenge to the dominant mode of knowledge production – not because there are multiple disciplines involved, but because of the generative nature of the process and because the nature of the knowledge produced does not always fit neatly into disciplinary categories or cultures. Transdisciplinarity disrupts traditional academic systems of accountability, evaluation and reward [14]. Yet, it is this form that has the greatest potential for innovation; especially when problems are complex – the kind of problems interaction design often faces. Our reading of the 3rd paradigm agenda suggests that the goal is transdisciplinarity in that this offers intellectual richness and greater methodological completeness. While disciplinary departments can ‘permit’ this engagement, and the outcomes of the engagement are considered legitimate by the community, this is not necessarily the case within the academic departments involved.

Issues of legitimation and institutionalization have received little attention in the literature and we argue that clarity is important for the future development of the field as an area of academic research given the role of departments (disciplines) in the creation and production of scholarly careers. For instance, tenure committees currently rely on “well known” or “familiar” disciplinary standards to recognize rigorous, sufficient

work – e.g., the number articles accepted to the highest impact journal in the field. Academics engaging in ID research may produce work where these standards no longer apply; or to continue with the example, where the topics or methods are suited to a journal outside their discipline. What modifications to the processes of tenure and promotion might be required to recognize varied ID contributions?

ID as Disciplined Transdisciplinarity

While a transdisciplinary approach appears to offer a rich way forward for ID, in the context of the university this move needs to be articulated in a way that the institution can recognise and be assured that the values and practices within individual disciplines are respected. We propose what we call ‘disciplined transdisciplinarity’ offers a way forward. This framing recognizes both the value of disciplinary depth as well as the need for new practices to foster and to negotiate what are, in essence, cultural and/or epistemological differences of those coming from different backgrounds. In a 2009 article Blevis & Stolterman [3] call attention to transdisciplinary issues in project settings. We develop these ideas further, and in the context of the university. We describe ‘disciplined transdisciplinarity’ as the simultaneous recognition of the value of disciplinary traditions in conducting research while at the same time recognizing the legitimacy of knowledge claims that go beyond disciplinary norms. There is value both in diversity and in discipline. While possibly introducing irreconcilable notions of truth, there is also the potential to create richer understandings, enhance creativity and to enrich the participants intellectually. Producing scholars and practitioners who can engage in this way is the work of the academy. Gerhard Fischer [8] has written extensively on pedagogy and with

Fischer we see innovations in pedagogy as critical in preparing the next generation of graduate students, for the challenges they will face as researchers, designers and academics.

The following examples illustrate the nature of the challenges facing interaction design and point to what is lost when there is limited or no interaction across scholarly communities working on similar problems. We focus on emotional design, an emerging area within interaction design in which there is growing interest – for example, there were SIG groups at the last three CHI conferences and in August 2009 the International Journal of Design issued a special issue on Design and Emotion.

Lottridge and Moore [12] investigated implications of authors' epistemological stance in their assessment of emotion. When research was undertaken from a rationalist perspective, the definition of emotion was rooted in psychology, and the practice of systems design and experimental evaluation was rooted in computer science. Researchers used classical scientific methods and objective physiological data to claim generalizable and repeatable trends in human emotional reactions. When the approach taken by the researchers was more interpretive, the papers tended to be from collaborations between authors from computer science and the social sciences or humanities. They used more flexible and open-ended approaches with the goal of deepening understanding of the process of making meaning of emotional interactions. They offered rich description, reflection and insight into the nature of the emotional response - how emotions are fluid, flexible, difficult to define, and changeable over time. The third group of papers analyzed was from

researchers who came primarily from industry and engineering. They were more pragmatic in their approach, selecting methods from different perspectives if they found them useful and with less concern for their epistemological underpinnings. Here mixed methods were used to create tailored solutions to practice-oriented problems. These practical designs were considered to be useable and useful in differentiating emotional reactions among products and systems.

In terms of the 3 paradigms argument [11] we can roughly map the pragmatic approach to the 1st paradigm, the rationalist accounts to the 2nd paradigm and the interpretive accounts to the 3rd paradigm. We argue that each approach offers different, valid and valuable contributions to the challenge of how to assess emotion, and each treats a different aspect of the larger complex problem. The researchers from the different studies come from a number of disciplines and are not necessarily in contact. As a result the literature in the area is not benefiting from the insights gained across these perspectives. By taking a 'disciplined transdisciplinary' approach to the problem, researchers from different disciplines could come together to collaborate, learn from each other, and utilize their disciplinary expertise - both theoretical and methodological - to enhance the potential to create a richer set of understandings and new possibilities.

Our second example is anecdotal. A recent panel at INTERACT (August, 2009) focused on a scenario for the development of an in-vehicle emotion sensing system to deal with the growing problem of car accidents caused by 'road rage' and aggressive driving [5]. The design problem generated heated debate among the

panelists and audience as it touched their deep personal beliefs about how the interaction between humans and technology 'should' be designed. For example, should cars track human emotions? If so, what are the technical limitations? Should the system display feedback so that the user is aware and can correct mistakes? What is the balance between technical and social choices? Is legislation part of the solution? With wicked problems [16] of this nature there is no 'correct' solution - only better and worse solutions based on varied criteria. A disciplined transdisciplinary approach with members representing ethics, law, engineering, visualization, and interaction design, etc, and an understanding of the generative processes such an engagement entails might better be able to 'set' the problem and create a broader range of potential solutions; something no individual group can address adequately on their own.

Conclusion

The CHI community has been successful in the difficult task of engaging individuals from a number of disciplines, including computer science, human factors, psychology and social sciences. In addition, HCI brings together academic and industry researchers and practitioners. This paper encourages this diverse community to start a dialogue on how to systematically recognize the challenges and opportunities raised by doing interaction design in the academy, and to find innovative ways to legitimate transdisciplinary contributions within academic careers.

Interaction Design is an area of research with roots in both HCI and design and is evolving as a field that benefits from epistemologies and methodologies drawn from across the intellectual landscape. While this work

at the interface of a number of disciplines and traditions is accepted within the professional community, it is not clear how this research and other forms of interdisciplinary engagement, can be accommodated in traditional universities where discipline and department align. There will be cultural differences in the structures available to accommodate disciplinary crossings, but the challenge of gaining recognition for the legitimacy of knowledge claims that are outside the norms of a single discipline are likely to remain.

We propose that doing interaction design might be better understood as new form of knowledge production; one in which disciplinary expertise is critical yet one which is able to transcend disciplinary categories to address the richness of the problem in its context of application. The various forms of 'interdisciplinary' that have been described in the literature provide a more nuanced understanding of the challenges facing interaction design for it to evolve and become institutionalized in the university. We ask: What does interaction design aspire to 'be'? Clarity on this point is essential as the paths to successful institutionalization and legitimation will be different depending on the answer to this question. As the case of emotional design illustrates, there is no single group or disciplinary expertise that alone can solve these complex problems. We offer the notion of *disciplined transdisciplinarity* as a model towards which to interaction design might evolve. The benefit of this formulation is that it allows the community to begin to address the nature of the institutional barriers that exist, and to develop strategies to assure that interaction design can evolve as its researchers and practitioners envision

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References

- [1] Barthes, R. Jeunes chercheurs cited in James, C. Introduction: Partial Truths. 1986. Pp.598-630 in *Readings for a History of Anthropological Theory*, edited by Paul A. Erickson and L. D. Murphy. Lancashire: Broadview Press.
- [2] *Beyond Productivity: Information, Technology, Innovation, and Creativity* . (2003). Washington, DC: National Academies Press.
- [3] Blevis, E. and Stolterman, E. Transcending disciplinary boundaries in interaction design. *interactions* 16, 5 (2009), 48-51.
- [4] Buchanan, R. Design research and the new learning. *Design Issues* 17, 4 (2001), 3-23.
- [5] Chignell, M., Hosono, N., Fels, D., Lottridge, D. and Waterworth, J. Responsive Interfaces: Mobility, Emotion and Universality. In *Proc. INTERACT 2009*, Springer Berlin (2009), 924-925.
- [6] *Facilitating Interdisciplinary Research*. Committee on Facilitating Interdisciplinary Research, Committee on Science, Engineering, and Public Policy, National Academy of Sciences, National Academy of Engineering, and Institute of Medicine. National Academies Press, Washington, DC, USA, 2005.
- [7] Fallman, D. The Interaction design research triangle of design practice, design studies and design exploration. *Design Issues* 24, 3 (2008), 4-18.
- [8] Fischer, G. and Redmiles, D. Transdisciplinary education and collaboration. In *HCIC-2008 Workshop: "Education in HCI; HCI in Education"*, (2008), 1-18.
- [9] Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P. and Trow. M. *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. Sage, London, UK, 1994.
- [10] Harper, R., Rodden, T., Rogers, Y. and Sellen, A. *Being Human: Human-Computer Interaction in the Year 2020*. Microsoft Research, Cambridge, UK, 2008.
- [11] Harrison, S., Tatar, D. and Sengers, P. The Three Paradigms of HCI. In *Ext. Abstracts CHI 2007*, ACM Press (2007), 1-18.
- [12] Lottridge, D. and Moore, G. Designing for Human Emotion: Ways of Knowing. *New Review of Hypermedia and Multimedia* 15, 2 (2009), 147-172.
- [13] Moore, G. and Timmerman, P. *Human-centred Design: Towards the Virtual Institute*. ITRC, Toronto, Canada, 1996. (Reprinted as KMDI Historical paper KMDI-HP-96-01)
- [14] Moore, G. *Re(defining) Interdisciplinarity: Re(forming) Universities*. Pp. 13-24 in *Interrogations: Creative Interdisciplinarity in Art & Design Research*. Loughborough: Interrogations Conference Committee, DeMontfort University Faculty of Art and Design & Loughborough University School of Art and Design, 2009.
- [15] Nowotny, H., Scott, P. and Gibbon. M. Introduction: `Mode 2' revisited: The New production of knowledge. *Minerva* 41, 3 (2003), 179-194.
- [16] Rittel, H.W.J. and Webber, M.M. Dilemmas in a General Theory of Planning. *Policy Sciences* 4, 2 (1973) 155-169.
- [17] U.S. Council of Graduate Schools, *Graduate Education: The Backbone of American Competitiveness and Innovation*. CGS, Washington, DC, USA, 2007.
- [18] Verplank website
<http://www.billverplank.com/professional.htm>