CHAPTER 7

Discussion

Theory weary, theory leery,
why can't I be theory cheery? (Tom Erickson, 2002).

My overview of the history of the "theory industry" in HCI and its diversification has shown, on the one hand, it to have been successful in shaping research but on the other, less impressive in being applied in practice. Clearly, it continues to play an important role in framing and moving the HCI research agenda forward but the chasm between theory and practice, identified early on in HCI (e.g., Landauer, 1991; Long, 1991) persists. Below, I explore the reasons for this and argue that, perhaps, the theory-practice divide could be bridged better, through rethinking how to develop HCI theory that can assimilate the messy and ever-changing, technologically augmented world.

Table 7.1 provides an overall summary of the different roles theory has been developed for in HCI. These are not meant to be mutually exclusive (and some do overlap) but to show the different ways that theory has and can play, as promoted by researchers in the Classical, Modern and Contemporary periods.

Table 7.1: A summary of the ways theory has been used and developed in HCI

Kind	Description
Descriptive	Clarifying terminology and guiding inquiry
Explanatory	Explicating relationships and processes
Predictive	Testing hypotheses about user performance
Prescriptive	Providing guidance on how best to design and evaluate
Informative	Importing relevant findings to ground understanding of HCI
Ethnographic	Providing detailed descriptions arising from a field study
Conceptual	Eliciting frameworks for informing design and evaluation
Critical	Couching HCI in a cultural and aesthetic context
Wild	Developing new theories of technology use *in situ*

7.1 MOST SUCCESSFUL

One of the most prolific and, arguably, successful developments in and applications of HCI theory has been conceptual frameworks, derived from an imported theory (or set of theories), the synthesis of empirical research (ethnographic, experimental and case study), design practice or a set of assumptions about the structure and/or function of phenomena. Unlike the design implications approach, whose value has been questioned by researchers, the conceptual frameworks approach has been received favorably in the HCI community. Frameworks often are the driving force that run through a research project, being the accumulation of a body of theorizing and empirical work, and which are illustrated by cases studies showing how they have been generalized and applied.

Conceptual frameworks can vary along a continuum of prescription-explanation: the more prescriptive a framework the more likely it will consist of a series of steps or principles to be followed. The more explanatory a framework, the more likely it will consist of a set of concepts or dimensions to be considered. Benford et al. (2009) propose a number of ways conceptual frameworks can be used from their research, including compiling and analyzing the extensive craft knowledge that already exists among artists and other designers, and helping technology researchers and developers identify requirements for new tools and platforms to support the development and orchestration of future user experiences. Evidence of the success of conceptual frameworks can be counted in the reporting by others of having used them in different projects, and ideally case studies of them being used in practice. The latter are less forthcoming, as practitioners have to eke out a living from consulting and often do not have the time or funding to publish their work (but see the set of case studies at id-book.com). There are, however, a number of frameworks that have been well cited in the literature, for example, Bellotti and Edwards (2001) context-aware framework, outlining principles of intelligibility and accountability; Bellotti et al.'s (2002) making sense of sensing systems framework explicating challenges, design issues and problems; Benford et al.'s (2009) interactional trajectories, which is a sensitizing framework for understanding cultural experiences, in museums, mixed reality games, etc., as journeys through hybrid structures, punctuated by transitions, and in which interactivity and collaboration are orchestrated; and Gaver et al.'s (2003) ambiguity framework, comprising a set of tactics for designing ambiguous representations, artifacts and situations aimed at getting people to interpret them differently. Interestingly, these frameworks have been largely prescriptive in their design advice, suggesting what to do (or not to do) — for example, Benford et al. (2005) recommend that designers "identify all known limitations of the sensing technologies, by considering range, speed, accuracy and stability of sensing."

Rogers and Muller's (2006) framework of sensor-based interactions was meant more as an articulatory device helping to define and shape user experiences. Instead of being prescriptive, it conceptualizes a number of core dimensions of sensors together with aspects of the user experience that are considered important to take into account when designing sensor-based interactions. The framework is intended to help designers, interested in developing innovative playful learning experiences that use sensor-based interaction (as opposed to GUI interaction) but aren't sure about how to put them to novel and innovative effect. There are many possibilities available to designers when

deciding which sensor technology to couple with which system response (and how). However, the new generation of sensing technologies (e.g., motion, light, pressure) can be problematic in what they can detect and how they detect it. The framework was proposed in recognition of this and to enable designers to explore how to exploit to good effect these new kinds of interactions.

More recently, Yuill and Rogers (2012) developed the "Mechanisms for Collaboration" conceptual framework, that presents the core psychological and behavioral mechanisms that are thought to underlie the successes of shared interfaces for collaboration and which are intended to be considered in conjunction with various kinds of physical, technological and social constraints, derived from a combined analysis of theory in the fields of Developmental Psychology and Ubicomp, and reflecting on everyday interactions. The framework is intended to help designers and researchers think about *multiple* concerns and dependencies when designing shared technologies. Rather than asking, "How do I design a multitouch surface or a natural user interface that will enhance cooperation or collaboration?" it suggests reconceptualizing this research question to become "What is the interplay between the various behavioral mechanisms for the proposed activity and setting?" For example, it suggests considering how to make obvious the way in which one should behave and how to give appropriate cues, as well as how to make more salient the cues that can lead to improved understanding, explication of intentions, and focus of attention. Hence, the aim is to provide a principled way for researchers and designers to make sense of the emerging empirical literature on the benefits of multi-user interfaces and to understand how they will be used in real-world contexts.

Ethnographic approaches have also stood their ground, making a significant contribution to the body of HCI knowledge, addressing Plowman et al.'s (1995) earlier concern: "what are work studies for?" The recent debates, outlined in Chapter 4, concerning how they should be framed, interpreted and applied have also highlighted both their successes and limitations.

7.2 SOMEWHAT LESS SUCCESSFUL

Many of the theoretically based concepts promoted in HCI, that were drawn from a variety of disciplines have largely fallen by the wayside, while a few have become common parlance. For example, the notions of affordances and context are those that have stuck and become mainstream while concepts such as mental models and cognitive dimensions, while popular to begin with, are no longer fashionable. Despite having much currency, the latter proved a step too far for designers (and others) to become sufficiently versed in to be able to talk about design issues with each other using such terms, as viscosity. One of the reasons is the effort required to learn them — even the basic set of 12. It seems akin to asking people to learn a new language late on in life, such as Esperanto, which if everyone learnt it, it would be great, greatly increasing our capacity for articulating design concerns. We would have shared references and would not spend countless hours aligning what we each mean by our nuanced meanings of common terms such as representation, platform and process. Instead, it seems stand-alone, one-off terms that conjure up what they mean intuitively have been the most widely taken up — even though they are often used much more loosely and in underspecified ways.

7.3 NOT SO SUCCESSFUL

Where imported theories have been least successful is when adapted as generalizable methods (i.e., the prescriptive and predictive categories), intended to be used by practitioners. The reasons for this lack of uptake are wide-ranging, and need to be taken into account in the wider context of applying theory in practice. Firstly, it must be stressed that it is foolish to assume or hope that theories "do design," however much the proponents of the theoretical approach would like (Barnard and May, 1999). Their input to the design process can only ever really be indirect, in the form of providing methods, concepts and analytic tools. A theory cannot provide prescriptive guidance in the sense of literally telling a designer what and how to do design. The contribution of any theory must be viewed sensibly and in the context of its role in the design process at large.

Secondly, designers already have their own established craft methods to use as well as practical interaction design techniques (e.g., prototyping, heuristic evaluation, scenario-based design). For this reason, the value of theory-informed methods must be seen in relation to current design practice — and which is why Benford et al.'s family of conceptual frameworks has often fared better than others, as they have tended to graft onto existing practice.

Thirdly, more time is needed to allow a complete theory/design cycle to mature (see Plowman et al., 1995) and show impact in the field (through paper citation and downloading, and successful products being built based on them). It may take several years before we see more success stories being reported in the literature — just as it took several years after GOMS was developed before its value in a real work setting was reported.

Fourthly, considerable time, effort and skill are required by many of the approaches to understand and know how to use them. In particular, many require a background or training in the mother discipline to truly understand its ramifications for HCI. Ethnographic fieldwork is now often required as part of an approach. Knowing how to "do" ethnography and to interpret the findings in relation to a theoretical framework (e.g., ethnomethodology, distributed cognition, cultural theory) is a highly skilled activity that requires extensive training and much painstaking analysis. It is hard to learn and become competent at: many a student in HCI, has been attracted by the ethnographic approach and the theoretical framework of distributed cognition, only to find themselves, in the midst of a field study, surrounded by masses of "raw" video data without any real sense of what to look for or how to analyze the data in terms of, say, 'propagation of representational state across media."

More generally, there is little consensus as to what contribution the various approaches can or should make to interaction design. The transfer vehicles that became the standard and generally accepted "deliverables" and "products"' for informing design during the 1980s (e.g., design principles and guidelines, style books, predictable and quantifiable models) are regarded as inadequate or inappropriate for translating the kinds of critical writings and detailed accounts that recent theoretical approaches imported into HCI have to offer. There is also less evident, a rhetoric of compassion (Cooper, 1991), where researchers from one community try to articulate what needs to be done in another community.

The analytic frameworks that were proposed, such as those derived from Activity Theory, have also suffered from being under-specified, making it difficult for researchers and designers to know whether the way one is using them is appropriate and has validity. This contrasts with the application of earlier cognitive theories to HCI, where the prescribed route outlined by the scientific method was typically followed (i.e., make hypotheses, carry out experiment to test them, determine if hypotheses are supported or repudiated, develop theory further, repeat procedure). Without the rigor and systematicity of the scientific method at hand, it is more difficult to know how to use them to best effect or whether what they come up with can be validated.

A further problem from both the designer's and researcher's perspective, is that there is now a large and ever increasing number of theoretical approaches vying with each other, making it more difficult for them to determine which is potentially most useful for them or, indeed, how to use one with respect to their own specific research or design concerns. Such a confusing state of affairs has been recognized in the HCI community and one or two attempts have been made to synthesize and make sense of the medley of approaches. For example, Nardi (1996) sought to compare and contrast selected approaches in terms of their merits and differences for system design. However, given that the various approaches have widely differing epistemologies, ontologies and methods such comparative analyses can only ever really scratch the surface. There is also the problem that this kind of exercise can end up similar to comparing apples and oranges — whereby it becomes impossible, if not illogical to judge disparate approaches (cf. Patel and Groen, 1993).

7.4 MOVING THEORY FORWARD: NEW FRAMINGS

As was seen in the previous chapters on HCI theory, a common practice has been to dismiss a dominant approach and replace it with a new research agenda, epistemology and framing of the research. This was a particularly popular tactic in Modern HCI theory. However, championing one theoretical approach over another often ends up being a matter of personal preference, stemming from one's own background and values as to what constitutes good design practice or research. At worst it can end up as a bun fight, where tempers flare and criticism becomes personal and even derogatory. That is not to say that one cannot highlight the strengths and weaknesses of a particular approach so long as it is constructive criticism.

Another way forward is to consider whether different epistemologies and frames of references can complement each other. The arrival of the situated action approach on the scene in the late 1980s illustrates this. Clancey (1993), originally a traditional AI researcher, became a convert with the turn to the social arguing how situated action made him think more about the language used in the classical theories of HCI, namely, "memory," "knowledge," "information," "symbol," "representation" and "plan." In terms of whether they should be abandoned in favor of new ones, such as context, situatedness, and contingency, he argued that while they suggest a new research agenda, it is not necessary to break away completely from traditional theories. Instead, he proposed reconsidering the relation of cognitive models to the phenomena that they were intended to explicate.

But some researchers revel in the rhetoric of dismissing other perspectives, where much of their stance is in criticizing the problems, limitations and flaws of anothers' approach. More recently, however, the zeitgeist has been towards more tolerance of other theoretical positions, suggesting that they can sit side-by-side (e.g., Bardzell, 2009) and be synthesized in novel ways (Rogers, 2011). Bannon (2011a) has also called for a re-imagining of HCI by encouraging more openness to new forms of thinking about human-technology relationships.

Table 7.2 highlights what a more open HCI might be like and the role theory would play (Rogers, 2009). It contrasts past concerns with future ones along four dimensions. Firstly,

Table 7.2: Framing past and future concerns for HCI (Based on Rogers, 2009)

Concern	Past	Future
Frame of reference	• users	• context
Method, theory, and perspective	• scientific approach • interaction design	• pluralistic • mixing
Outputs	• ethnographies• • models and tools for analysis •• design guidance	• insights •• creating new ways of experiencing• • value-based analyses

in terms of a frame of reference, it suggests that the focus of HCI shift from "the user" to embrace a wider context. This is already happening, with many researchers being preoccupied with personal, social and cultural aspects of technology use and augmentation as much as user's needs. Secondly, it notes how the methods, theory and perspective of HCI have in the past followed either the scientific approach (e.g., conducting experiments based on cognitive theory and doing user testing) or interaction design (e.g., prototyping, user studies, ethnography) and is being replaced with a multiple and hybrid methodology (including running experiments and doing ethnography together) that previously might have been considered incommensurate, but which are being mixed and even mashed in order to probe and analyze the wider and sometimes elusive set of concerns. Thirdly, it suggests that the current way of working together inspired by interdisciplinarity, is making way for various forms of transdisciplinarity. The "trans" refers to integrative knowledge based on the convergence of concepts and methods from different research areas, including computing, philosophy, psychology, art and design, ethics and engineering. It involves moving between the big picture and the details of a

research question, using a combination of strategies, design methods and theories. For example, this could involve the application of philosophical theory to technological innovation, where conceptual philosophical analysis is fed into the design process and the experiences of being engaged in user studies are fed back into the philosophical analyses. In summary, transdisciplinarity is an approach that focuses on a broader goal: transcending disciplinarity and using collections of theories and their associated bodies of knowledge as and when deemed appropriate — which is well suited to HCI and the practice of interaction design (Blevis and Stolterman, 2009). Fourthly, whereas in the past, outputs from HCI research and practice have been either design implications or rich descriptions from ethnographic research; models of the user or the user experience; or conceptual and evaluative tools for analysis, it suggests that future outputs will demonstrate how to develop user experiences and human augmentation that covers a range of human values.