Five Lenses:
Towards a Toolkit for Interaction Design

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The Roving Tribes of Interaction Design

This volume is concerned with establishing foundations for interaction design. "Foundations" strikes me as an ambitious metaphor, suggesting, as it does, a solid base upon which a single, unified edifice will be erected. And, following the metaphor a step further, it assumes the existence of a stable, well organized community with a shared set of values that is ready to embark upon a such construction project.

I don't believe these assumptions hold up. To me, the state of interaction design feels more primitive. Rather than being an organized community, interaction design feels closer to being composed of a number of roving tribes who occasionally enounter one another, warily engage, and, finding the engagements stimulating, remain open to other encounters.

If this is the case, how do we make progress? I suggest that rather than trying to construct a unified, coherent account of interaction design, we would do better to take a more syncretic approach, gathering appropriate concepts and exploring their interplay without, however, insisting on resolving their tensions and contradictions.

In this essay I explore these issues. I begin with a definition, and illustrate my approach to partitioning the terrain of interaction design using five conceptual "lenses." In so doing, I cover most of what I see as the theoretical roots of interaction design. I then turn to the role of theory in interaction design, and suggest that a good way to begin is to assemble a toolkit of concepts for interaction design that consists of appropriately sized theoretical constructs.

Interaction Design

I define interaction design quite broadly:

> Interaction design has to do with the design of any artifact, be it an object, system, or environment, whose primary aim is to support either an interaction of a person *with* the artifact, or an interaction among people that is *mediated by* the artifact.

Although some see interaction design as particularly concerned with digital systems—either computer systems or artifacts with embedded computational capabilities—I see no reason to exclude humbler artifacts. The forces that shape our interactions, from perceptual and motor processes such as seeing and touching, to social and cultural phenomena such as imitation and fashion, are agnostic with respect to whether an artifact contains digital components. Indeed, much of what we understand about the design of non-digital artifacts—whether it be how to make a switch with a satisfying 'click,' or how clothing functions as a means of expressing identity—are applicable, as well, to digital systems. Finally, as computer systems become increasingly embedded in our artifacts and environments, and even the most mundane objects are tagged and tracked by digital systems, our ability to discriminate between the digital and the non-digital will fade, even should we wish to maintain it.

The Terrain of Interaction Design

Figure 1 shows a series of chess games in Washington Square, in New York City. In the foreground we see a chessboard, the players rapt in concentration. To one side of the board a few captured black pieces are gathered together; to the other is a pair of chess clocks that meter out the players' allotted minutes. Farther back we see other chess games, each with its circle of spectators. Still farther back we see passers by, most of whom are oblivious to what is going on, but a few of whom may be drawn into the circle of spectators, and then, perhaps, into playing a game or two themselves. And in the far background we discern trees and buildings, and see that the games are taking place outdoors in a city square.

To me, this picture represents, in miniature, the terrain of interaction design. As such, I'll use it to describe how I go about making sense of interaction. As a designer, I'm continually confronted with new sites and situations, and for each site I need to come up with a way to see it, to analyze it, to design for it, and to understand the consequences of what I have designed. I find that I work best when I orient to the site or situation in which the interaction takes place; for me the site comes first, and the conceptual framework and methods and tools come later. As a designer, my principal challenge is to make sure that I don't get too fixated on a single aspect of the situation, that I don't get trapped in a particular perspective or approach. Rather than find a single conceptual framework that fits the situation, instead my aim is to stay grounded in the concrete reality of the site, and to bring a range of conceptual lenses to bear on it.

Figure 1. Pickup chess games in a park.
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Five Lenses

So let us return to the picture in Figure 1. We will walk through the image, taking a look through each of the set of lenses that I bring to bear on the sites with which I engage as a designer.

Mind

I begin, perhaps as a consequence of my early training, with the mind, envisioning the game in purely cognitive terms. Playing chess, viewed through this lens, involves a cycle of perception, cognition and action. This is the domain of cognitive psychologists, such as Donald Norman (1986), and is concerned with issues such as how people might go about learning chess, what sorts of errors they might make while doing so, how players develop strategies, why people find games of this sort engaging, and so on. This is the lens most often deployed by interaction designers versed in human-computer interaction, and is of critical import in the design of screen-based applications.

Proxemics

Moving on, we deploy a new lens, shifting our focus from minds to bodies and the ways in which we use our bodies to interact with one another. In the picture we see a number of bodies: the player in the left foreground, his face rapt

in concentration as he gazes at the board; the spectator in the right foreground, gazing at the game, his posture suggesting that he has settled down to watch for a while. In the next game back, a player is reaching to move a piece, after which he will quickly slap the chess clock to stop his time and start his opponent's; that game, too, has spectators, though they seem less intent on the game and more interested in talking with one another. This is the domain of ethnomethodologists such as Adam Kendon (1990), sociologists such as Erving Goffman (1963), and anthropologists such as Edward Hall (1983), who focus on the role of expression, posture, gaze, gesture and timing in interactions within small groups. This lens is important for those concerned with designing material artifacts—especially large artifacts such as control panels, rooms and buildings—as well as those designing digital systems which support mediated (i.e. disembodied) interaction.

Artifacts

Next we shift our view to the artifacts in the picture. We see a chessboard arrayed with white and black pieces; off to one side we see a cluster of captured black pieces, and off to the other a pair of chess clocks. These artifacts play a variety of roles, interacting with the views from other lenses. One role of artifacts, that Norman explores in *Things that Make Us Smart* (1993), is to ease the cognitive load: the board and the pattern of pieces on it serve to preserve the state of the game, enabling players to focus on planning their next moves. Another role of artifacts is their status as objects that are manipulated by the participants. While the manipulation of chess pieces is a relatively simple matter, ethnomethodologists like David Sudnow demonstrate that the ways in which people physically interact with objects is incredibly subtle. In his book, *Ways of the Hand*, Sudnow (2001) gives an exquisitely detailed account of the process of learning improvise jazz on the piano, and the ways in which his hands (not his mind) learned to traverse the keys. A third role of artifacts is depicted by Ed Hutchins in *Cognition in the Wild* (1995), in which he explores the view that cognition is not just a property of minds, but can be seen as a global property of systems of people and artifacts. A fourth role of artifacts is a social one, in that the pair of clocks substitute for a human time keeper. This view is explored by Bruno Latour (1992), who eloquently makes the case for a sociology of artifacts, suggesting that it is artifacts which stabilize and extend human interaction patterns. This lens—with the glimpses it gives of artifacts and their varied roles—is important for those who design material artifacts, as well as for those who aim to replace material objects with digital 'equivalents.'

The Social

Now we move to a level of analysis that is not grounded in anything that can be explicitly seen in our picture. The social lens examines relationships, both among people and between people and objects, and tries to take notice of the norms and rules that underlie them. Thus, in our picture, we see not just people, but people who stand in relationship to one another—players, spectators, passersby—and who are obeying rules as a consequence. Of course, the game of chess has a set of rules associated with it, but of more interest are the unwritten rules being adhered to. Thus, one chess player does not shout at the other as he ponders his move (something which is permissible in games like baseball), nor does he, after capturing a piece, toss it into the dirt beneath the table. There is an unarticulated notion of "proper" behavior in play, and one that, furthermore, extends beyond the game. Thus, the onlookers watch quietly and refrain from offering advice (again, unlike some other games), and one, standing nearby, appears to be waiting his turn to take on the winner, thus participating in an unarticulated but mutually understood notion of turn-taking. This is the realm of social psychology, sociology (Goffman, 1963), ethnomethodology (Heath & Luff, 2000) and anthropology (Whyte, 1988). This lens is essential to any interaction designer wishing to reflect upon ways in which a newly designed artifact may disrupt situations in which it is introduced, or the ways in which—as with a web-based chess game—the digital equivalent of a face to face interaction may have very different social effects.

The Ecological

The last lens I'll discuss gives, by far, the broadest view. It is the view of the interaction as it is situated in its larger context. Here we look not just at the chess game and its audience, but at its temporal and spatial location. Temporally, these chess games are a fixture, recurring nearly every day in the same location— outdoors in a public square. By virtue of its location, passersby, on their ways to other places, become aware of the game and, over time, notice that it is a recurring event. Perhaps, another day, when on less urgent business, one passerby may pause to watch and even to play, thus helping the game, as an on-going event, to sustain and extend itself. Even if the game fails to interest most passersby, it still contributes to the liveliness and interest of the urban space. This lens, looking at the ways small interactions like the chess game flourish (or not) in the context of other interactions, is exemplified

by the work of urbanists like Jane Jacobs (1961), urban designers like Kevin Lynch (Banerjee & Southworth, 1990), architects like Christopher Alexander (Alexander et al., 1977), and anthropologists like William Whyte (1988). This lens is crucial for the interaction designer who creates artifacts for use in public places, and who desires to create self-sustaining interactive systems.

About the Lenses

I do not wish to argue that these are the five and only five lenses of use to interaction designers; others may wish to suggest additional lenses, or to partition things up differently. The main point is that there are multiple perspectives from which interaction designers can analyze the sites or situations with which they are confronted, and that designers will fare best when they are able to pick up one lens, then another, and then a third. It is the ability to fluidly shift perspective that is, in my opinion, of most value to interaction designers.

The Role of Theory

Now I'd like to turn to the question of the role of theory in interaction design. As I've said, I think its too soon to try to create a unified theory or framework for interaction design; instead, I suggest that a more productive way to proceed is to syncretically assemble a toolkit of theoretical constructs and methods, such that for any of my five lenses (or other lenses to be suggested), there are a number of theoretical constructs and methods that might be brought into play.

Choosing Theories

In my opinion, the key question is how to select theories, etc., that are likely to be useful. I believe the problem is one of scale. It is not clear what the proper scale of theoretical construct is, and often we err by seizing on apparently useful concepts without sufficiently understanding their contexts. As an example, consider the notion of "affordance." Affordance, a concept developed by ecological psychologist J. J. Gibson (1979), is now commonly misused in interaction design. As initially defined, it was a *relational* concept, denoting the possibility of an interaction between an organism with particular characteristics and an artifact with particular characteristics. Gibson developed a sophisticated argument—drawing on a number of concepts ranging from "affordance" to "agent" to "ecology"—that organisms perceive their environment in terms of affordances. "Affordance," as Gibson used it, has little to do with its popular use in interaction design as a visible indication that something can be done (visibility has nothing to do with affordances), nor does it make any sense to talk about an artifact affording something without also specifying the sort of entity to which the affordance applies. The problem is that "affordance" has been plucked out of the theoretical framework which gave it its power and nuance, and used in isolation has become a bit of jargon with little value.

At the same time, we need to be cautious about adopting full-fledged theories from other disciplines. The reason is that theories play multiple roles. At its most basic level, a theory is a useful simplification, a mechanism for imposing a framework on the blooming buzzing confusion that is reality. To the extent that its basic components are understandable and memorable, theories serve as common frameworks, *lingua franca* that allow insiders and outsiders to speak to one another using a common language and shared concepts. Thus biological concepts such as "disease," "bacteria," "virus," "germ," "infection," "antiseptic," and "antibiotic" provide both specialists and layfolk with a common ground through which they can understand and discuss basic medical issues. However, theories play other roles within a discipline. In particular, a theory can serve as a framework for debate within a discipline and, as a consequence, over time the theory is articulated and refined in response to the debate resulting in a more complex theory, or possibly multiple versions of the theory.

These two roles of theory stand in tension to one another: the utility of a theory for promoting debate and further articulation of itself within a field may actually interfere with its utility in communicating beyond the field. The requirements for promoting articulation within a field involve supporting the creation of distinctions and nuances that can serve as the ground upon positions can be established, whereas the requirements for communicating beyond a field require the ability to depict the conceptual framework in a few bold and broad strokes of the brush. While the ability of a framework to support the finely detailed nuance is not necessarily at odds with the ability to also serve as a simplifying framework, it often is.

What this boils down to is that we need to think carefully about the theoretical constructs we choose to use in interaction design. We need constructs that are neither so large that they bring along all the analytical baggage developed in response to internal disciplinary debate, but not so small that they lose the ability to provide a useful framework for dealing with complexity that makes them useful in the first place. In short, we need a conceptual middle ground, a repertoire of theoretical constructs that are larger than "affordance" or "breakdown" or "flow", and that are smaller than "activity theory" or "distributed cognition" or "ethnomethodology".

Towards a Conceptual Toolkit

What sort of theories and methods belong in a 'toolkit' for interaction designers? What is the right size or scale of a theory or method? How do we go about finding them?

One possibility is that we need to take theories developed by other disciplines and simplify them for our purposes, pruning away the complexity generated for internal disciplinary purposes. This is something along the lines that Don Norman has suggested in his proposal for an applied discipline of cognitive engineering (Norman, 1986). Perhaps, just as cognitive engineering could serve as tool when applying the "Mind" lens, other theories might simplified for use with other lenses. Another candiate—an area of Economics known as mechanism design that examines the ways in which systems of incentives are designed to shape large scale group behavior — is discussed by Picci (this volume).

Another possibility is that interaction designers might, by drawing on the work of multiple disciplines, develop design-oriented theories that are targeted at particular areas of interaction design. Such design theories would span several lenses, but by virtue of being targeted at a particular design domain, would retain some simplicity. For example, over the last several years, my colleagues and I have been developing the construct of social translucence, which is a design approach to designing of systems that support human-human collaboration (Erickson & Kellogg, 2003). Similarly, Katie Salen and Eric Zimmerman (2004), have made an impressive attempt to develop a theory of game design, drawing from a wide range of disciplines.

A third possibility is that a more radical form of simplification is needed: elsewhere I've proposed that adapting the notion of pattern languages from architecture (Alexander et al., 1977) might provide a way of creating a *lingua franca* for interaction design (Erickson, 2000a, 2000b) that would foster communication amongst the diverse constituencies which make it up.

Concluding Remarks

I began this essay by objecting to the synthetic program of trying to create a unified and coherent foundation for interaction design. Rather than an organized field with the shared values necessary for such a project, interaction design feels much closer to a confederation of nomadic tribes who occasionally come together. Instead of joining together to construct foundations, we would be better advised to procede syncretically by sharing our tools—i.e. theories, concepts and techniques—and trying to apply them in our own territories. When we encounter one another again, by virtue of our attempts to use some of the same tools for different ends, we'll have a bit more common ground, and a new set of experiences to share.

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Biography

Thomas Erickson practices interaction design and research at IBM's T. J. Watson Research Center in New York, to whence he telecommutes from his home in Minneapolis. His current work involves studying and designing systems for supporting computer mediated communication (CMC) in groups and organizations, and his principle aim is to create systems that can mesh with the social processes that govern our daily communication practices. Erickson's approach to systems design is shaped by methods developed in HCI, and theories and representational techniques drawn from architecture and urban design. His theoretical and analytical approaches are drawn primarily from rhetoric and sociology. In addition to CMC, research interests include virtual communities, pattern languages, genre theory and interaction design. Over the last two decades Erickson has published about fifty refereed papers, and has been involved in the design of over a dozen systems ranging from advanced research prototypes to commercial products). Prior to joining IBM Research in 1997, he spent nine years at Apple Research, five years at startup called Software Products International, and before that five years studying Cognitive Psychology at University California, San Diego.