CHAPTER 2: THE CURRENT STATE OF INTERACTION DESIGN THEORY

In this chapter I will discuss the current theoretical uses of the term ‘interaction design.’ We will find that the term is elastic, which will be demonstrated by the descriptions of interaction design as synonymous with HCI to interaction design as a new discipline. I first look at how HCI researchers have theorized the term interaction design. Secondly, I examine design-oriented views of the concept and I will show how the issue is framed less theoretically. Interaction design is approached as a question of multiple design strategies that ultimately focus on design stances and methods. In tracking the shifting contours and intellectual premises in relation to interaction design, a clear difference emerges in the capacity and limits of theorizing between HCI and design. This poses two very distinct (almost inverted) problems with respect to understanding the field. HCI theory operates from a strong philosophical centre that affords HCI researchers with a stable theoretical purchase. Yet the same strength creates an intellectual constraint of viewing interaction and design exclusively through the lenses of user-centrism (the user is the object of study) and science. On the other hand, design lacks a strong philosophical orientation and design researchers tend to be wary of theoretical views of design. This limits the discussion to descriptions of practice. However, in the absence of theory there is an unconscious idealism for explaining what is left unexplained.
A number of edited collections of essays on interaction design have recently been published that provide a representative range of views of theory and practice (Pirhonen, 2004, Bagnara and Smith, 2005, Moggridge, 2007, Kolko, 2007). However, I have considered only monographs that can be said to make explicit theoretical claims on behalf of interaction design. I’ve taken this approach since a full manuscript is where people generally turn to first in understanding a field, and secondly because it is in the space of a book those authors’ theses are allowed full expression. The exception to this is a book chapter by Terry Winograd (Winograd, 1997), which is pioneering in the way it outlines a possible direction for interaction design.

2.1 Beyond human-computer interaction?

Terry Winograd was among the first computer science researchers to argue for a shift from considering the computational device to considering the experience of computation and how it shapes us (Winograd and Flores, 1986). He eventually saw the need for a discipline in parallel to computer science to address these emerging concerns that he labelled “interaction design” (Winograd, 1997). The key movement he identified in computing science was the move away from concentrating on machinery to concentrating on people:

Over the next fifty years, the increasing importance of designing spaces for human communication and interaction will lead to expansion in those aspects of computing that are focused on people, rather than machinery. The methods, skills, and techniques concerning these human aspects are generally foreign to those of mainstream computer science, and it is likely that they will detach (at least partially) from their historical roots to create a new field of “interaction design” (Winograd, 1997, p.157).

Winograd had long been an advocate for the need for a design orientation in tackling the larger and deeper issues raised by computing: “The use of technology in turn leads to fundamental changes in what we do, and ultimately in what it is to be human. We
encounter the deep questions of design when we recognize that in designing tools we are designing ways of being” (Winograd and Flores, 1986, p.6). In his seminal book, *Understanding Computers and Cognition* in 1986 (Winograd and Flores, 1986), Winograd together with Fernando Flores set out to radically reconsider HCI, computing and cognition. Flores’ background was not in computing but in social and political organizations where he applied cybernetic theories to management of large-scale projects. This in part accounts for the intellectual diversity of their approach. Another factor was Winograd’s own experiences with the limits of thinking in artificial intelligence (AI) at the time. The radical rethinking of *Understanding Computers and Cognition* is founded on a critique of rationalist tradition in HCI and computing. Winograd and Flores turn from scientific realism described as a “mathematico-logical paradigm” to philosophical positions of Heidegger, Gadamer, Maturana, and Austin (Winograd and Flores, 1986). They were well aware that philosophical investigations rooted in biology, hermeneutics and phenomenology drew them far afield from traditional thinking in computer science, yet they argued that “theories about the nature of biological existence, about language, and about the nature of human action have a profound influence on the shape of what we build and how we use it” (Winograd and Flores, 1986, p.xii). Winograd and Flores laid out the touchstone critique of scientific realism and rationality in computing that allowed for further critiques based on issues of embodied cognition, context, interpretation and the role of design.

In 1997, Winograd spoke directly to the notion of interaction design. Winograd’s observations were from a relatively short article titled “From Computing Machinery to Interaction Design” included in *Beyond Calculation: The Next Fifty Years of Computing* (Winograd, 1997). In the article, Winograd describes three trajectories he observed as
emergent at the time: 1) Computation to communication; 2) Machinery to habitat, 3) Aliens to agents.

The first trajectory, “computation to communication” minimizes the core computational abilities of computing in favour of less complicated but more influential communication capabilities of computing. The shift from computation is marked by the industry emphasis and the “excitement” over applications such as the Internet, email, chat and the communication applications and tools including word processing, email, file sharing and so on. It is further signalled by the economic commoditization of computation related hardware and software.

The second trajectory, “machinery to habitat” aligns the perspective of computing with the user. The user does not see machine qualities in a computer such as the processor, architecture or operating system. Winograd observes that the experience is not of machine or application; it is of accessing “cyberspace” through networking or immersion in low-resolution virtual realities current at the time, including MUDs (Multi-User Dungeon), MOOs (MUD Object-Oriented), and IRC (Internet Relay Chat). In noting the shift away from the machine to the virtual he asserts the important reconsideration of space as a medium for personal experiences, actions and living. Winograd offers the neologism, interpsace, marking the outdating of the traditional concept of interface, a new space “inhabited by multiple people” and machinery “in a complex web of interactions” where computing is “media for the creation of virtualities: the worlds in which users of the software perceive, act, and respond to experiences” (Winograd, 1997, p.154).

The last trajectory is “Aliens to Agent” in which the argument is part lament of the failures of ‘good old fashioned artificial intelligence’ (GOFAI) as heralded in science fiction. The trajectory acknowledges that the goals of AI have become more modest,
focusing on simpler software brokers and intermediaries acting on behalf of users in applications and on the web. The super intelligent computer robots or aliens as Winograd phrases it, have given way and continue to give way to the simple software servants of the web – the software agent. The lesson in the failings of AI is the need to re-examine the foundational assumptions (an argument pursued in *Understandings Computers and Cognition*) and start over from “new footings” (Winograd, 1997, p.157).

A result of the combined trajectories is that a need for a new discipline of interaction design arises. The emerging innovations and problems would be in communication, interaction and experience. Computing hardware, software, and related skills would become commodities. The shifting boundaries of computing would favour interaction design over traditional computer science:

Many of the most exciting new research and development in computing will not be in traditional areas of hardware and software but will be aimed at enhancing our ability to understand, analyze, and create interaction spaces. The work will be rooted in disciplines that focus on people and communication, such as psychology, communications, graphic design, and linguistics, as well as disciplines that support computing and communication technologies (Winograd, 1997, p.156).

This expansive notion of computing paradoxically plays out on a broader social level but in effect narrows the focus of computing science as an academic discipline. Anticipating Carroll’s problem of fragmentation (Carroll, 2003), a convergence of art and science in the pursuit of complex interaction is not the direction that Winograd sees: “Will it [computing science] extend outward to include graphic design, linguistics, and psychology? What would it even mean to have a science of that breadth? (Winograd, 1997)” Winograd predicts that computing science will contract its boundaries and concentrate on deepening its roots and gaining greater intellectual coherence and depth that will enable it to focus on fewer but more significant technical advances. In many respects,
Winograd implies that the epistemological difference between computing science and interaction design is simply too great. Similarly, while HCI is related to interaction design, it is at the same time very different.

In the midst of this interdisciplinary collision, we can see the beginnings of a new profession, which might be called “interaction design.” While drawing from many of the older disciplines, it has a distinct set of concerns and methods. It draws on elements of graphic design, information design, and concepts of human-computer interaction as a basis for designing interaction with (and habitation within) computer–based systems. Although computers are at the centre of interaction design, it is not a subfield of computer science (Winograd, 1997, p.159).

Winograd outlines a new direction for interaction studies that includes the emergence of a new discipline of interaction design that draws on the traditions of design and the concepts of HCI. The field has computing at its core but it is epistemologically distinct from computer science. Its importance is that it addresses the need to design spaces for human communication and interaction. In relation to this study, the question asked was how does this blueprint for interaction design play out in the discourse of HCI (and design)? As I will show, the question largely fell on deaf ears. From the field of HCI, the new field of interaction design is either interpreted or constructed solely within the terms of HCI, i.e. a subfield of computing science, or HCI researchers ignore the proposed substantive and new nature of interaction design by viewing it as synonymous with HCI.

In contrast to Winograd, *Interaction Design: Beyond Human-Computer Interaction* by Jenny Preece, Yvonne Rogers, and Helen Sharp (Preece et al., 2002) best reflects the view that interaction design is a subset of computing science. The text has widely been used as a textbook in HCI and interaction design classes; recently a second edition was released (Sharp et al., 2006). As a textbook, it is written to be accessible rather than theoretical. However, the approach rests on an underlying theoretical view and the authors advance two theoretical claims: as a textbook on interaction design it promises a definitive description of
the field; and secondly it claims that interaction design is “beyond human-computer interaction.”

The authors define interaction design as: “designing interactive products to support people in their everyday and working lives” (Preece et al., 2002, p.6). Preece et al view interaction design as a progression from the multi-disciplinarity of HCI (psychologists, computer programmers, educational technologists), to the incorporation of a wider array of diverse disciplines including graphic design, industrial design, film, narrative, sociology, anthropology and dramaturgy (Preece et al., 2002, pp.8-9). This progression is in response to a context of new emergent hardware capacities including location awareness, large displays, and information appliances. In short, this is an aggregation of academic disciplines, interdisciplinary fields, and design practices. On the surface, this is similar to the visionary view of interaction design discussed in Chapter 1. However the authors theorize very little if at all as to how these divergent disciplines, fields and practices interact within a concept of interaction design. In reality, the authors conceive of interaction design similarly to the status quo view described in Chapter 1 (see 1.1.2 The status-quo view of interaction design), which is that interaction design is indistinguishable from what is commonly understood to be HCI.

The authors describe interaction design in three parts: 1) the user and usability, 2) design process, 3) evaluation. The authors begin with a caution against approaching interaction design from the “nuts and bolts” level of design, such as interaction styles. Rather, central to the problem space of interaction design is user experience and usability. The user is constituted within the conceptual framework of cognition. That is the user is conceived of as an individual operating within the world from a set of mental models (logical representations of how the world works), managing and processing information
(memory and data), and relying on artifacts and representations to supplement and aid cognitive processes (memory and computational aids). Interaction designers aim to map interface metaphors to a cognitive understanding of users for a particular routine and setting. Optimization of the mapping is key and this is achieved by determining the requirements and psychological effects critical to an efficient relationship between user, the system design, and the actions. The authors view design and the user as an optimization problem: “we consider what humans are good and bad at and show how this knowledge can be used to inform the design of technologies that both extend human capabilities and compensate for their weaknesses” (Preece et al., 2002, p.73).

The second part of Preece et al’s description of interaction design is design process. In the authors’ view, the design process is dictated by the needs of users, and as a consequence is largely comprised of identifying needs and establishing design aims to address those needs or requirements. Design in this context is seen as empirical data gathering and analysis resulting in representations of tasks that conceptualize how a design system might support the tasks. Designers rely on a process of iteration or going back and forth between assessing needs and creating representations. The authors discuss formal techniques for task description, task analysis, task representations, and forms of prototyping. In terms of methodology, the authors offer examples of software engineering lifecycles and an introduction to user-centred design theory and techniques.

Evaluation is the third part and completes the description of interaction design. While evaluation is discussed separately, it is tied to the design process. In particular, its aim is to assess the fulfilment of design requirements and for this it relies on empirical observation for validation. Four primary methods are discussed: direct observation of users, interviewing users, experimental studies, and expert reviews. Analysis of the data is
discussed introducing readers to quantitative and qualitative analysis, heuristic accounts, and predictive theories like GOMS (Goals, Operators, Methods, and Selection Rules) and Fitts Law.

By many measures, Preece et al’s account of interaction design is not different from HCI. The authors’ description does not vary from HCI conceptions of the user. For example, users are at the centre of the discussions on models whether the models be behavioural, social, perceptual or cognitive, or emotional. Users participate in the design process as either people to observe, collect data from, and/or to involve through user-centred-design. Systems are assessed through evaluation of the users’ performance through means of observation, direct questioning or by comparison or simulation of predictive models of behaviour. Additionally, the authors adhere to the underlying scientific realism of HCI whereby observable phenomena constitute the design problem in the testable form of requirements and the resulting outcome can be put to the test and establish empirically verifiable claims.

The core ideas of design as presented in Interaction Design: Beyond Human-Computer Interaction were already part of the HCI discussion. Preece and her colleagues have brought design issues into focus and made simple and operational the description yet conceptually they have not moved from current accounts of HCI. Ultimately, many concepts in Interaction Design: Beyond Human-Computer Interaction can be found in earlier HCI textbooks like Designing the User Interface: Strategies for Effective Human-Computer Interaction (Shneiderman, 1997) such as GOMS, task analysis, Fitts’ Law, mental models, information processing, observational fieldwork, scenarios, user-centred design, expert review, usability, experiments and so on.
In many respects, Preece et al have written a solid and accessible introductory HCI textbook; unfortunately it says little about interaction design. In a review by Sri Hastuti Kurniawan in the *SIGCHI Bulletin* (Kurniawan, 2003), Kurniawan applauds the book for its richness in approach to the topics. Kurniawan commends the authors for a pedagogically sound contribution and she strongly recommends its use in HCI classes. However, she is confused by the contradictions in defining interaction design: “although its title indicates that it is about interaction design, this term is never clearly defined…more terminological rigour is needed to help the readers clearly understand the various nuances of meaning…given the lack of rigour in defining the discipline of interaction design, it is perhaps premature to call it an interaction design book” (Kurniawan, 2003, p.15). In addition, she wonders how the authors go beyond HCI. Austin Henderson, in his review in *ACM Ubiquity* (Henderson, 2002) finds the text praiseworthy with only one reservation in agreement with Kurniawan:

I do find myself quibbling a bit with the subtitle of the book ("Beyond Human-Computer Interaction"). The phrase "human-computer interaction" can be taken to point fairly narrowly at the design of the user interface; however, its meaning, particularly as applied to the discipline ("HCI"), has broadened over the years, and now addresses most of the material covered by the book. So I see the book going beyond user interface, but not beyond HCI (Henderson, 2002).

Theoretically the book does not demonstrate the claims it makes more in title than in substance. An alternate and perhaps more applicable framing would be similar to Steve Heim’s recent interface design textbook, *The Resonant Interface: HCI Foundations for Interaction Design* (Heim, 2008). Here Heim makes no greater claims than to argue for the importance of HCI concepts to be understood by interaction designers, and sets out to make a designer’s handbook on HCI. Jon Kolko’s *Thoughts on Interaction Design* is similar in this regard (Kolko, 2007).
Evident in *Interaction Design: Beyond Human-Computer Interaction* is the strength of the theoretical foundation of HCI. HCI has reached a theoretical maturity where debates about better and evolving conceptual formulations are productive contributions to the field. Such is the case with Kaptelinin and Nardi’s *Acting with Technology: Activity Theory and Interaction Design*, which I introduced in Chapter 1 (see 1.2 Role of theory in interaction design). The authors set out to comprehensively explain activity theory and offer it as better theory for advancing HCI. Activity theory has its roots in applied psychology dating back to the 1920’s in the work of Leont'ev, Vygotsky and Engeström in the 1980’s (Nardi, 1996). The aim of activity theory is to understand consciousness within human activities in a way that reveals motivations in actions (Nardi, 1996). Human experience is seen as mediated through artifacts and signs within an activity system. For HCI, an activity system provides a broader and more ecologically valid unit of analysis then tasks. For example, the theory provides HCI a set of conceptual tools for understanding the complexities of multi-user activity, development over time, and expertise (Bertelsen and Bødker, 2003).

Kaptelinin and Nardi have different aims than Preece et al yet both texts use the term interaction design indistinguishably in meaning from HCI. In *Acting with Technology* interaction design is quite incidental despite its inclusion in the subtitle: “HCI, CSCW [computer supported cooperative work], and CSCL [computer supported collaborative learning] comprise a set of related fields. In the past HCI was often shorthand for the whole collection, but it appears that ‘interaction design’ and more recently ‘informatics’ are increasingly used as general references including these fields as well as others such as digital design” (Kaptelinin et al., 2006). Despite the fact that claims for interaction design are merely nominal in *Acting with Technology*, the authors’ critique of HCI is relevant to this thesis.
Kaptelinin and Nardi identify with Cooper and Bowers’ distinctions within HCI (Cooper and Bowers, 1995, p.61): “between ‘first-wave HCI’ and ‘second-wave HCI’ … we position activity theory as a second-wave theory, a representative of a group of interaction design theories that encompasses postcognitivist approaches” (Kaptelinin et al., 2006, p.16). While Cooper and Bowers do not give a definitive description of second wave HCI, they stress that the “‘second wave’ is highly varied and fragmented in comparison with early HCI” (Cooper and Bowers, 1995, p.61). Second wave HCI generally denotes a shift away from the early cognitive psychology formulation of HCI that has been referred to in varying forms in the discussion so far. In Acting with Technology this description is further detailed as a focus on situated and contextualized issues. Since activity theory is generally applicable and used in many contexts, the subtitle (Activity Theory and Interaction Design) is intended to signal that the discussion of activity theory is within an HCI context. The literature Kaptelinin and Nardi reference was published in the historical context of HCI, and so for the sake of clarity and in the context of this study, I will revert to using the term HCI (in its broadest sense) where the authors use interaction design.

Kaptelinin and Nardi’s discussion on the role of theory, particularly postcognitive theories, is relevant to this study since interaction design operates in and responds to the same discourse of embodiment and commitment to practice that I will elaborate on in Chapter 3. The authors observe that HCI is in need of theory because of critical challenges to its origins in cognitive psychology. The challenge grew from the situated action perspective of ethnomethodology, in particular Lucy Suchman’s pivotal text Plans Situated Actions: The Problem of Human-Machine Communication (Suchman, 1987).

Ethnomethodology is an alternative to ethnography developed by Harold Garfinkel (Garfinkel, 1967) in which observations are made without commitments to social theory in
analysis or generation. Graham Button writes, “it [ethnomethodology] shifts the emphasis away from the production of sociological accounts and theories of social doings to an emphasis upon the description of the accountable practices involved in the production of naturally organised phenomena” (Button, 2000, p.325). As such, ethnomethodology is committed to uncovering actual practice in as rich a detail as possible without recourse to external framing such as theoretical work. It is on this count that Kaptelinin and Nardi are critical of ethnomethodology. The first reason is due to its untenable resistance to any form of abstract representation or theory in expressing lived experience: “The actions and practices have come and gone with the passage of time. We have only representations, which of necessity are abstractions. We fashion these representations to the best of our ability, but inescapably shape them with our viewpoints, perspectives, constructs, and theories in doing so” (Kaptelinin et al., 2006, p.20). Secondly, and perhaps more importantly to the authors, a postcognitive conception of HCI cannot be without a strong theoretical foundation, indeed they argue that is the role of activity theory. The authors cite the pragmatist stance of the philosopher Richart Rorty who argues for a proactive understanding of theory that it is not a perfect account of reality rather it is the theory’s ability to create actions to cope with reality that is important (Kaptelinin et al., 2006, p.24). The text goes a long way toward fleshing out the nuances of second wave or postcognitivist or even third paradigm (Harrison et al., 2007) conceptions of HCI. More generally even, it is applicable to interaction studies as a whole. It asks for a full account of the design of interactive technology in its multiplicity of actions, contexts, people and experiences. In doing so, Kaptelinin and Nardi provide a sound critique of cognitive based HCI.

Activity theory with respect to HCI argues for a revised formulation of the user beyond cognition and therefore radically changes the way systems are conceptualized and
understood. In fact, what we can say to be knowledge is formulated differently in the context of activity theory. What is clear is the theoretical need to address the critique and the theoretical revision at the epistemological level. Particular to this thesis, Kaptelinin and Nardi provide a clear example of the value of theoretical revisionism. In their case the authors argue within HCI, while in this thesis the argument is parallel to HCI and focuses on a distinct field of interaction design.

In summary, I began with Terry Winograd’s outline for a shift in computing science and HCI, and the emergence of interaction design as a movement beyond HCI. Winograd stretches the term to include a new discipline, ‘interaction design’; the premise of which is that it will be distinct from the intellectual foundations of computer science and HCI. I discussed how Preece et al.’s Interaction Design contributes a solid account of HCI but does not contribute to an understanding of interaction design. If anything, it illustrates the inherent difficulty in attempting to describe interaction design from within the limits of the intellectual foundations of HCI: the centrality of the user and the underpinnings of scientific realism. I found in Kaptelinin and Nardi’s Acting with Technology an incidental and unconsidered use of the term interaction design which is endemic in the field of HCI. In both cases, the elasticity of the term interaction design contrasts considerably with Winograd, returning in essence to the assumptions and limits of HCI. However, in the case of Acting with Technology, there is a clear critique of HCI that offers a model for theoretical debate either within or outside of HCI with respect to the design of technology. Additionally, the authors laid out shared theoretical needs with interaction design in the ideas of second wave or postcognitvist HCI that reveal a commitment to practice and a broadened notion of cognition.
2.2 Strategies in interaction design

Winograd in an interview in Preece et al’s Interaction Design provided a designer’s perspective of interaction design. He discussed the inherent challenge of interaction design as academic research given its tacit knowledge and experiential nature: “It's not the kind of thing that you can set down easily as, say, you can scientific formulas. A lot of design tends to be methodological. It is not about design per se but it is more about how you go about design…” (Preece et al., 2002, p.71). Much of design discourse is rooted in a methodological exploration and a similar approach is extended to interaction design. I’ve characterized the approaches discussed in this section as a discussion of strategies, where methodological concerns are evident and never far, yet there is a guarded exploration at a level beyond techniques and routines. Guarded in the sense that design theorists have shied away from theoretical formulations, instead seeing design as practice-based and therefore too contingent and dynamic for theoretical formulations; or wary of theory from past importation of theories from other disciplines (e.g. math, physics, engineering, behavioural sciences, etc) that view design as an application domain. Strategies as a result are articulated positions and principles intended to guide designers through the various relationships with materials, clients, audience, and stakeholders that constitute the various forms of design.

Alan Cooper and Robert M. Reimann in About Face 3: The Essentials of Interaction Design (Cooper et al., 2007 , Cooper and Reimann, 2003) describe tactics as ways of designing or creating particulars like menus and dialog boxes. Strategy, in Cooper and Reimann’s case is considering the interaction between users and interfaces. Cooper and Reimann define interaction design as “the definition and design of the behavior of artifacts, environment, and systems, as well as the formal elements that communicate that behavior”
The authors emphasize the shift from the focus on form in traditional design to creating things that behave in interaction design.

*About Face 3* is similar to Preece et al’s *Interaction Design* in that it aims to deliver practical and accessible concepts and tools to practitioners and students, however it differs in that it is not a textbook. Cooper and Reimann at times giving low level critiques of particular software and at other times offering design principles (they refer to these as axioms) and practical tips.

*About Face 3* is divided into three sections. The first section concentrates on design process and how to achieve a systematic understanding of the user. In this section Cooper and Reimann elaborate on what they refer to as *Goal-Directed Design* process, modeling users and personas. The second section marks the narrowing of the book’s focus to interface design. It covers a high level but detailed sequence of critiques, remedies, and principles to common interface design concepts and pitfalls such as *undo, user input, dialogue, smart software,* and *interaction models.* The final section of the book dives into the low-level interface design issues, what the authors refer to as tactics. The authors cover *mouse controls, manipulation, controls, errors* and the application to the web and beyond the desktop including mobile devices, appliances, and telephony.

One problematic aspect of the book is the degree of disconnect between the early discussion on process and conceptualization of designing, and the progressively more detailed set of principles meant to address particular interface issues in the latter parts of the text (the authors never clarify the relationship they see between interface design and interaction design). It would have been helpful to have an in-depth case-study or discussion of how the process-oriented issues can operationalize the latter interface design principles, as this remains unclear. The interface design discussion does not contribute significantly to
our study since the realm of interface design is not the focus. I will limit my discussion to the early section of the book covering methods and modeling the user, and in particular Cooper and Reimann’s use of narrative, and especially their innovation of *personas*, which has had the greatest impact on the field (Pruitt and Grudin, 2003, Blomquist and Arvola, 2002).

The centrality of the user continues from HCI to interaction design. Cooper and Reimann’s unwavering premise is that the design of the behaviour of software must exclusively be understood and validated by the user’s perspective. The authors argue for the separation of design from the software engineering process. The reason for their position is that programmers and engineers design from an implementation model of computing that is concerned with the functional logic of a computer, whereas people understand computers from a mental model that is based on past experiences with everyday objects and routines. For example, most people understand documents like physical documents in the world, typically they have only one copy and that copy belongs to them. The software developed using the implementation model violates the mental model understanding by creating at least two copies (one saved to a hard drive, the other not saved but stored in dynamic RAM) and both copies belong to the program (another program cannot open it). This creates untold confusion and common errors with simple functions like saving, opening, and renaming files. Further, implementation models lead to a conception of users based on tasks. The virtue of tasks is that they can be mapped to a single or set of discrete executable routines on a computer, i.e. saving a file to the hard drive. Mental models are guided by goals and not tasks. Cooper and Reimann provide the example of getting to work in the morning where the goal is to get there as quickly and safely as possible regardless of
whether the tasks are braving traffic in a car, taking public transport, or walking part of the way.

Based on this the authors discuss innovations to existing design methods in what they have synthesized as *Goal-Directed Design*, which describes the following: separate design from programming and design first, then program; focus on user goals established by creating personas that are archetypal representations of potential users; derive the behaviours of the product from the personas; and lastly apply design principles to behaviours. *Goal-Directed Design* is a process of modeling users and their domains through observational fieldwork, then defining requirements from these models, and translating the knowledge captured in the models and requirements into a design framework that reflects the goals and needs of users. The method combines techniques of ethnography, stakeholder interviews, market research, product/literature reviews, detailed user models, scenario-based design, and a core set of interaction principles and patterns. The authors divide the process into five phases: research, modeling, requirements definition, framework definition, and refinement.

The method can be seen to be an incremental variation of human-centred approaches to design such as *Contextual Inquiry* (Beyer and Holtzblatt, 1998) or even the *usability engineering lifecycle* (Mayhew, 1999) with acknowledgments of the admonitions of focusing on goals over tasks and principles over style guides. *Goal-Directed Design* augments the latter process in part by incorporating the ethnographic commitment of *Contextual Inquiry*, however the main distinctions lie in its assertions of goals and its use of narrative to represent the goals in a contextual manner, as well as the innovation of personas, a story-based user model.
In the research phase, as discussed above, the authors draw on the ethnographic fieldwork and analysis of Hugh Beyer and Karen Holtzblatt’s *Contextual Inquiry* (Beyer and Holtzblatt, 1998). The authors do suggest some improvements such as using a shortened discount version of the interviewing process that lessens the contact hours and relies on samplings of key individuals, reduces the size of design teams for greater efficiency, shifts to a goal orientation over task analysis, and looks beyond the business context to separate end-user from client needs. From the analysis of the fieldwork, designers construct a user model in the form of a persona: “a precise descriptive model of the user, what he wishes to accomplish, and why” (Cooper et al., 2007). Personas are composite representations based on “behavioural” data collected from the fieldwork and interviews of a range of people. The personas are used as archetypal representations that “stand in” for the user throughout the design process and help to address potential behaviours and motivations of potential users. Well developed personas guard against the conception of the user needs stretching or contracting in the development process along with the changes in the software (elastic user), or the focusing on the marginal or exotic features as the central issue (design edge cases). They also guard against the possibility that the designer designs for themselves (self-referential design).

Constructing the personas involve analyzing gathered data to map “behavioural variables” of participants, analyzing for patterns and synthesizing characteristics into a number of different persona types. These types can be tested against narratives that designers create to “test” the actionable qualities of the personas. Cooper and Reimann see narratives as a “powerful tool” to generate and validate design ideas. Here narratives validate personas, which in turn are utilized in scenarios to generate requirements and design frameworks. The authors cite Carroll’s description of scenarios in which designers
make use of particular stories to construct and illustrate design possibilities (Carroll, 2000). The strength of scenarios is their depiction of concrete actions and the ease in which the scenarios can be created and modified. Scenarios describe an environmental setting, agents and actors with particular roles, typically engaged in one or more activities. Cooper and Reimann suggest minor improvements to Carroll’s description of scenarios for their use with Goal-Directed Design, such as making scenarios less abstract and more concrete, and keeping actors on the level of goals rather than too quickly depicting tasks. Nevertheless, the authors show a commitment to narrative throughout the process they describe.

In summary, About Face 3 discusses a method for interaction design that overlaps with other human-centred approaches, however it is distinct in its emphasis on goals over tasks. The text falls short of operationalizing the methodological explorations in relation to the interface design principles that consume much of the book yet the basic techniques are applicable to interaction design beyond user interface issues and have been adopted as such. Ironically, the design process they describe is highly appropriate for a broader understanding of interaction than graphical user interfaces, yet the authors’ view of interaction design is more constrained than Preece et al.’s understanding in Interaction Design (Preece et al., 2002). The authors provide an accessible text that synthesizes a range of HCI and usability innovations and concepts into a design method. While Cooper offers a strategic discussion of the position of the designer in shaping the relationship between the user and the design artifact, the greater effort and contribution to interaction design is methodological. Goal-Directed Design is a series of sequenced techniques, i.e. scenarios, discount ethnography, personas, etc. that form a methodological whole.

The limits of the contribution to interaction design theory result from the coherency of the method. This all-encompassing approach makes it difficult to substitute or modify
techniques. This in itself would not be a problem however the lack of underlying theory provides little guidance in how a designer might modify techniques. For example, what are the design tradeoffs between combining deeper ethnography with discount personas rather than the other way around? The weakness of the strategic discussion is evident in the contradictions and the lack of clarity of the guiding principles. For example, the commitment to ethnographic accounts of users is at odds with the analysis of “behavioural variables,” which assumes a reductive view of the narrative account that is in conflict with ethnography. The limits of Cooper and Reimann’s contribution is not that it is methodological but that at a strategic level it is insufficiently explained or theorized in order to provide guidance for use of techniques or to resolve epistemological contradictions. Additionally, Cooper and Reimann adhere to a user-centred model for design that, though in many respects may be beneficial; its exclusive focus limits the fuller understanding of interaction design.

In Thoughtful Interaction Design: A Design Perspective on Information Technology, Jonas Löwgren and Erik Stolterman take on the notion of strategy and push the idea to its limits (Löwgren and Stolterman, 2004). Their focus is on a conceptual reconsideration of the role and attributes of the designer in relation to the responsibilities of interaction design. The authors see interaction design strategies as decision-making shaped by the difficulties of designing a material without qualities (Löwgren and Stolterman, 2004, p.5) i.e. the virtuality of the digital. Whereas other authors attempt to describe the contours of the discipline and practice of interaction design, Löwgren and Stolterman argue from the perspective of the designer who they position at the centre of the discipline. To those familiar with design theory this will not be a surprise but in the context of HCI-influenced theories of interaction design this is a radical step.
The theoretical strategy proposed by Löwgren and Stolterman is for the interaction designer to understand his or her role within design as a *thoughtful designer*. The authors describe design as a “knowledge construction system” whereby a designer embodies the craft of design through a sensibility and language (articulation), knows of the qualities of digital material, and possesses design ability. The craft itself is expressed in paradigmatic examples, digital artifact genres, and external criticism (role of critics).

The authors relate the idea of a thoughtful designer to that of an articulate craftsman (Löwgren, 2008). As such, the existential identity of the designer is bound within one’s design ability, one’s understanding of use qualities, and historical awareness of interaction design. The latter refers to a designer’s knowledge of design history and especially past exemplars in interaction design, and the emergence of interaction design genres or styles. The notion of historical awareness is straightforward whereas the ideas of designer ability and use qualities require further explanation.

Despite the centrality of the designer, the explanation of a designer’s abilities is at times opaque and difficult to follow. Further, the authors are reluctant to provide more than “inspiration” or an “introduction” to explain design abilities. They argue that each “person [designer] is unique” and “it is ultimately a question of *designing* oneself as a designer” [original italics] (Löwgren and Stolterman, 2004). Nevertheless, it can be said that design ability is composed of skills and knowledge. Skills operate at the level of craft and are dependant on the design domain. Knowledge is at a higher level and applicable across design disciplines. The higher level attributes include the ability to reason and communicate about design, and the ability to be creative and analytical about design process and outcomes. Equally important and often overlooked in technology related design is aesthetic sensibility. The designer understands and shapes the dynamic gestalt experience.
of the designed artifact in ways that are often unique to the designer. Gestalt is the overall impression or experience that dynamically emerges over time (or through interaction).

Further, designers make judgments that require an ethical sensibility that aligns the diverse and sometimes conflicting values and ideals of the designer, client and other stakeholders.

Löwgren and Stolterman see designer judgment as critical to interaction design. Design is viewed as dependant on judgment since design situations are complex, dynamic and require action with incomplete information. As a primary act in design, designers set provisional limits and constraints based on their judgment for what constitutes the design situation. Judgment in another form balances the fullness of the design situation by composing all aspects including the technical, functional, ethical, and aesthetic. The authors detail a third form of judgment characterized as navigational judgment, in which designers decide among many alternatives in the design process throughout the making of a design artifact.

Löwgren and Stolterman are indebted to Schön’s ideas of design and the reflective practitioner (Schön, 1983). Schön describes the design process as complex, dynamic and uncertain, in which a designer navigates and creates by reflection on his or her actions. Schön’s ideas were a critique of the technical rationality of design and other professions where rationalist theories were imposed. Like Schön, Löwgren and Stolterman see in design a resistance to such theories and the impossibility for design to be encapsulated in rational descriptions. The authors purposely aim to provide descriptions of design over logical formulations. This in some respects is a targeted response to the HCI-influenced theories of interaction design (Löwgren, 2002). Designers make judgments with practical considerations of the situation at hand and with an eye to a future situation that does not yet exist, and as such design, unlike HCI, is not concerned with truth in the scientific sense that
underlies HCI. Further, the HCI description of design process is one of optimization or problem solving that is a matter of method and technique in which designers are interchangeable. Löwgren and Stolterman scornfully reject the notion of a designer as a “methods operator” and in doing so offer up their richer descriptions of the characteristics of unique competencies of designers.

In addition to design ability there is a language acquired by designers that expresses a sense of artifacts and their use qualities. Again, the authors shy away from strict formulations but provide “tools-for-thought” that assist in the developing of a sense of interaction design products and their qualities. While rigid definitions do not serve anyone, such hedging is weak theorization. There is the need to explain the role of interpretation in a practice that is inherently resistant to formalization. The authors argue that dialogue takes place in the act of designing and reflection yet it is fair to ask what constitutes reflection. The “tools for thought” are a set of suggested, use-oriented qualities for digital artifacts that are not general but are applicable across individual examples. The qualities are described in five groups: users’ motivations; immediate sensation; social outcomes of interaction; structural features of the artifacts; and users’ created meanings.

There is a holistic quality to the attributes in that it is their combination, or what Löwgren and Stolterman refer to as the dynamic gestalt that designers understand and shape as the experience of the digital artifact. The authors describe the dynamic gestalt of a digital artifact as the overall character that is experienced almost at once. To designers the attributes are independently discernible and assessed through dialogue, elaborations, and rearticulated into new formulations through an internal process of critique.

*Thoughtful Interaction Design* advances many key issues with respect to theorizing interaction design independently from HCI. Löwgren and Stolterman adopt a revisionary
approach that draws on the traditions of design discourse in their account of interaction
design. The authors reformulate interaction design practice with an emphasis on the unique
qualities of designers and design artifacts, which are no small steps in the context of HCI
informed theories. The authors place the designer at the centre of designing interactive
systems rather than the user. The designer is constituted as an embodiment of design
language, sensibilities of digital artifacts and materials, and design abilities. Additionally,
the authors articulate design as a practice rather than a science. They offer a rich description
of design practice within a digital context and detail a range of qualities of digital artifacts.

The value of the authors’ contributions to this thesis is great. The authors illustrate
the epistemological differences between interaction design and HCI. They demonstrate the
rewards of understanding interaction design through the lens of design discourse. And they
establish the theoretical particularities of design, namely the understanding of practice, the
singular role of the designer, and the challenges of formalization. Nevertheless, particularly
on the last point, there are clear limits to understanding interaction design as a set of
strategic positions that are ultimately under theorized. The authors referred to their
descriptive qualities of digital artifacts as “tools for thought.” The authors’ assertion of the
resistance to theory in design has them adopting a “toolkit” approach to reasoning. Tools in
this sense have precedent in design. The notion, encapsulated in the idea of a “toolkit”
arose within the “second generation” design methods movement as characterized by Hans
Rittel (Rittel, 1972) in which design theorists became wary of prescriptive and overly
rational approaches to design methods: the idea of a designer as a “methods operator.” The
toolkit represents an open-ended approach to techniques where designers can pick and
choose techniques at their discretion depending on their view of the design situation.
Bravely, Löwgren and Stolterman apply this model to design knowing and thinking. The coherency of the different tools selected rests with the designer:

A thoughtful designer, equipped with appropriate tools for reasoning, will be more able to sort out what is important, make necessary judgment calls, distinguish true needs for more information from better-safe-than-sorry approaches, and identify fruitful directions in the exploration of possible futures that is called design. The ideas we have presented in this book are intended to serve as such tools for reasoning (Löwgren and Stolterman, 2004, p.171).

Putting aside the significant question of what separates thoughtfulness from tools for thought, what is the underlying basis in thinking and knowing that motivates a selection of one tool over another? In other words, how does a designer know if the toolkit is “equipped with appropriate tools for reasoning” or not? How did a particular tool come to be part of the toolkit? And how does a designer know if a selection of a “tool for reasoning” is good or not? The problem with the “toolkit” model is that it offers no reasoning or context for the tools it contains, i.e. it offers no guidance to designers for selecting one tool from another. It in fact is not a model at all but rather a repository or list that makes no claims for its contents whatsoever. In this sense, the idea of a “toolkit” is meaningless and questionable in value. It provides no useful explanation of the thinking actions of design.

Henrik Gedenryd (Gedenryd, 1998) wrote of how “iteration” in design, the repeating of the design process or reversal of sequencing within the process is not the solution for flexible design methods that it is often heralded as being. In fact, Gedenryd argues that iteration in design is a poor fix for the underlying problem of viewing design as a linearly sequenced set of discrete operations. He explains how in the case of the waterfall model, the traditional design management model of tasks flowing sequentially into later tasks, iteration is not an improvement but an erasure of the underlying rationale for a model at all:
Adding iteration to a model means that you allow for the included phases to be repeated;...[Iteration is] an ill-considered added feature that handles a certain condition, but which in doing so goes against the original idea, and is therefore incompatible with it–thereby, in reality it constitutes no solution at all.

By allowing for iteration, a stage model comes to saying that you can do anything, in any order, as many or as few times as you like. By allowing for everything, it no longer says anything about their order. But if you do that, you have given up what was the purpose of these models in the first place: to specify what things to do, when to do them, and in what order, so as to guide the designer. The only substance that remains is a list of the activities that are included (Gedenryd, 1998, pp.97-98).

And so iteration as an ad hoc extension undermines the model it is intended to support. The same applies to the ad hoc extension of a toolkit to either design methodology or in the case of Löwgren and Stolterman, design thinking. The “toolkit” model does not provide an underlying rationale. It does not answer the questions of what makes a “reasoning tool” appropriate and how a designer assesses one tool over another.

Some may answer that the appeal of the toolkit is that it does not impose a rationale and logic on the different design or reasoning techniques, thus avoiding the errors of past design methods and theories. Yet rather than dismantle the prescriptions of the past methods and theories, toolkits perpetuate the notion that a designer is separate from thinking and actions in design. In other words, design reasoning and techniques can be categorized as discrete operations that can either be assembled as a tightly related group of interdependent tools or assembled as a loose set of tools with no relations among them. In either case, a designer can be reduced to a “methods operator.” Toolkits address only the organizing principles behind discrete operations in design not whether discrete operations themselves are a valid way of understanding design.

Toolkits separate design thinking and actions from the designer and tend to reduce the actions of a designer to a selection and implementation of tools. In order to mitigate the
problems of toolkits, Löwgren and Stolterman assert the role of a “thoughtful designer.”

We can presume that the coherency and selection of tools rests with the thoughtful designer. Any separation of the thoughtfulness and tools for thought are resolved by the reflection and actions of the designer. And so what makes a thoughtful designer? How is a designer thoughtful? How does a designer become thoughtful? Löwgren and Stolterman suggest it is through preparedness:

We have emphasized the importance and responsibility of interaction design. To handle this responsibility, our recommendation to interaction designers is to be prepared: prepared to act in a design process, encounter new design situations, learn and develop as designer, and understand historical developments and future technological trajectories (Löwgren and Stolterman, 2004, p.171).

The authors imply an ethical commitment to interaction design is sufficient to mobilize a designer in designing oneself as a designer. What motivates this commitment? Preparedness speaks to a reasonable state of readiness a designer must have, but how does a designer become prepared and how do they know they are sufficiently prepared? How is a designer to learn to exercise design judgment and how do they know if their judgments are good or not? The passage above describes designers who are left to their own devices and rely on their own encounters with design and their reflective vigilance of that history. The critical point that is left unexplained is what enables designers to make the right judgments that lead to better design outcomes?

As stated earlier, Kaptelinin and Nardi in Acting with Technology (Kaptelinin et al., 2006) criticize ethnomethodology for what they characterize as holding a “radical antitheory position.” Ethnomethodology, a variant discipline of ethnography within sociology, rejects “sociological theorizing” and actively resists generalizations and abstractions choosing instead to rest its understanding on “actual” and “real-worldly sources:”
Antitheory such as ethnomethodology struggles with its own contradictions. The very idea of the orderliness of human conduct is itself an abstraction. The work of studying orderly conduct through the empirical investigation of specific instances amounts to the development of a theoretical principle, much as investigating instances of species diversity is part of the work of developing a theory of biological evolution. That human conduct is "orderly" is not itself a foregone conclusion. Human conduct might be studied as chaotic, or as swinging between order and disorder, or as order within chaos. The assumption that specific instances of organized action can be studied theory-free is without ground. All observation is a view from somewhere (Kaptelinin et al., 2006, p.18).

It may be an exaggeration to label Löwgren and Stolterman and other design theorists as anti-theory however as we’ve discussed, design discourse has a long practice of resisting formalizations and theoretical abstractions. This is in part historical; based on past theoretical incursions from other disciplines and design theorists’ own early failings with methodological studies (Alexander, 1971, Jones, 1977). Nevertheless, the criticisms Kaptelinin and Nardi raise with ethnomethodology are applicable to design. The implicit notion that design could be theory-free is ultimately an argument for an absolute idea of design that eludes us, “this is just the way design is” or a randomness that is surprisingly and incredibly coherent despite its complexity. Or as in the case of Löwgren and Stolterman, the learning and knowledge construction of a thoughtful designer occurs through existing as a designer in a manner that is every bit real but cannot be formalized. In either case, the assumption is of a reality beyond our grasp or our ability to articulate in theory. The assumption is idealist and leaves the impression that designers and design are mysterious black boxes. Despite the avoidance of theory we cannot avoid a philosophical understanding that may be problematic, an absolute view of design or an idealist view of design that ultimately sells short interaction design research inside and outside the interaction design communities, and limits design education to a guild model of one-on-one mentorship.
In summary, I have shown the limits of articulating interaction design as a strategic formulation that remains shy of the depth and commitment of theorizing. In the case of Cooper and Reimann’s *About Face 3* the insufficient theorizing undermines the methodological contribution. The coherency of the method can be inexplicably rigid since the lack of deeper explanation provides little guidance in modifying the techniques of personas and scenarios, for example. Additionally, the discussion supporting the method overlooks epistemological contradictions like the reduction of observations in ethnography to analytical variables. Löwgren and Stolterman’s under-theorizing is a product of resisting formalizations and generalizations of the things they richly describe, namely the practice of interaction design. The result is an informative and nuanced set of digital artifact qualities, design abilities, and design language that are put forward as parts of a reasoning toolkit reliant on the designer’s judgment for coherency and productive reasoning. The weakness lies in the black-box description of the designer. Left unexplained is what guides the designer to make judgments and how a designer learns to exercise design judgments and make assessments of their decisions. Lastly, Cooper and Reimann adhere to a user-centred description of interaction design, whereas Löwgren and Stolterman adopt a revisionary approach, drawing on the traditions of design discourse, and reformulate interaction design by emphasising the uniqueness of the designer and design artifact.

### 2.3 Next steps

I stated at the beginning of the chapter that there is an inversion between HCI views and design views of interaction design. HCI theory is mature whereas design-oriented conceptualizations of interaction design are at a less theorized level that I referred to as strategy. I also discussed at the outset of the chapter how the term interaction design endures a degree of elasticity in its definitions and use. Figure 3 represents in matrix form
out review of current theories and viewpoints related to interaction design discussed in this chapter. The current conceptualizations have been plotted on a horizontal axis that shifts from theory to strategy, and a vertical axis that shifts from descriptive/explanatory theories and viewpoints to revisionary ones. This axis represents the traditional requirements of a theory to explain and define concepts reliant on logical abstractions and a potentially conflicting revisionary view that is unique to design practices and relies on embodied descriptions of practice. In addition, the matrix is divided into four disciplinary foci that the conceptualizations intersect: HCI, Post-Cognitive HCI, Design, and Interaction Design.
Figure 3 Literature reviewed in this chapter is plotted in a matrix of two dimensions: descriptive/explanatory to revisionary, and theory to strategy. The grey shaded area indicates the literature and theory gap in interaction design.

In HCI theory, Preece et al’s *Interaction Design: Beyond Human-Computer Interaction* (Preece et al., 2002) is not a theoretical text, however it rests on a strong theoretical foundation of HCI. In Figure 3, *Interaction Design: Beyond Human-Computer Interaction* occupies the most theoretical and descriptive/explanatory view in our review. As a reflection of the theoretical maturity in HCI, Kaptelinin and Nardi’s *Acting with Technology: Activity Theory and Interaction Design* (Kaptelinin et al., 2006) offer a balance of approaches between descriptive through to revisionary theory of HCI. The
theory critiques the behavioural and cognitive sciences in favour of a post-cognitive HCI. Kaptelinin and Nardi’s text occupies the most theoretical and revisionary position in respect to HCI and post-cognitive HCI in Figure 3.

By contrast, the texts reviewed in this chapter that point to a notion of interaction design independent of HCI are under-theorized and defined here as strategies. In Figure 3, Löwgren and Stolterman’s *Thoughtful Interaction Design* (Löwgren and Stolterman, 2004) is placed in the interaction design quadrant and toward the strategy and revisionary ends of the spectra. Winograd’s “From Computing Machinery to Interaction Design” (Winograd, 1997) was published as a polemical article, arguing for a clear break from computing science for interaction design. Key challenges in building an interaction design theory from these texts is that they are either emergent positions stated as polemics or descriptions without underlying theoretical structure or they are bound within or reactive to HCI theory. As mentioned earlier, Ehn’s participatory design (Ehn, 1989) and Schön’s reflective (Schön, 1983) practice offer clear starting points for a theory of interaction design. These theories are located in the design quadrant in Figure 3.

The depth of the debate between HCI and post-cognitive HCI demonstrates the maturity and robustness of theories for HCI. At the core of the theories are two notions: user-centrism in which the user is the primary focus of study or rhetorical claim (Cooper and Bowers, 1995); and scientific realism. The debate between HCI and post-cognitive HCI advocates is not over the centrality of these two notions of HCI; rather it is around the theoretical construction of the user as based on behavioural and cognitive sciences or non-cognition views like activity theory. Theoretical depth is demonstrated by the ability to probe beyond descriptions, in this case cognitively or contextually defined users, to the underlying concept, in this case the user. While the question of what constitutes a user may
be up for intense discussion, the theoretical principle of user-centrism is not, which
demonstrates the maturity of the theory. Additionally, the theory provides coherence for the
methods of HCI. In Preece et al’s descriptions of methods the user-centric principle is
clearly evident. The basis for the design process is user needs and the basis for evaluation is
user performance. The logic and rationale for the use and combination of techniques rests
with the principle of scientific realism. HCI design method is founded on the empirical data
gathering and analysis of users that results in representations of tasks and situations of use.
In effect, any techniques used for gathering requirements that are in line with the principles
of scientific realism adhere to the idea that user needs are empirically observable,
discoverable and testable. The strength of this is that it allows for wide experimentation and
selection on behalf of system designers with respect to techniques for requirements
gathering as long as the experimentation addresses the principles involved. This is evident
in the range of methods from interviews, to conversation analysis, to cultural probes used
for requirements gathering. Additionally, the principle of scientific realism rationalizes the
relationship between evaluation and design, where observable phenomena constitute the
design problem in the form of requirements and the resulting system, assuming it has been
implemented in accordance with the requirements, can be empirically tested. Any claims
for users, design of the system, or interactive systems use can be verified. The verifiability
of claims rests in the use of techniques that afford measurability of the phenomena and
independence, assessed by the nature of evidence separate from theory and by the
minimizing of subjective interpretations. Again, the virtue of this approach for an HCI
practitioner is the guidance and degree of freedom with respect to use and selection of
evaluation methods.
There is considerable virtue in the way in which scientific realism is operationalized in HCI theory and mobilized for discoveries about users and systems while at the same time incorporating the making of computer systems. The requirements and resulting design plans represent hypothesizing the user and system design. The designed system embodies the relationship between user and system by implementing the requirements. As such the hypothesis can be tested in the form of evaluating user and system performance. Shortcomings in the resulting design can be attributed to requirements gathering, design representations in system plans, or implementation, i.e. the making of the system. Notwithstanding the critical drawback that scientific realism does not help HCI account for implementation, the actual design and making of the interactive system, the advantage of this position is it provides a better justification than existing interaction design theory for the methods employed in developing a digital artifact.

However, the same strength that affords HCI researchers a stable theoretical purchase also forms an intellectual constraint that prevents the full understanding of interaction design. In other words, the underlying theoretical precepts of HCI act as a gravitational pull distorting views of interaction design in ways that mimic HCI, i.e. basing interaction design on the principles of user-centrism and scientific realism. Yet why should interaction design be considered user-centric? Löwgren and Stolterman’s *Thoughtful Interaction Design* favour a designer-centric view of interaction design over a user-centric view. What is the applicability of scientific realism if interaction design is not a science? Design discourse has resisted abstractions and formalizations in favour of irreducible descriptions of experience and practice. The totality of design artifacts and especially designer judgments are not measured by empirical discovery and verification. While interaction design may not adhere to principles of user-centrism and scientific realism, this
does not however mean that it should be non-theoretical or theory-free. The downfall to the approach of strategies is that interaction design is under-theorized, leaving the field to be defined by others outside of the field or leaving it perpetually under-developed since building theoretical discourse on little supported descriptions or underlying contradictions is simply too challenging.

The first proposition is that current descriptions of interaction design are inadequate and there is a need for theorizing of interaction design in order to better value its role in the research and creation of interactive systems.

This chapter aimed to address the first proposition that interaction design is insufficiently theorized. In Figure 3, the striped area within the interaction design quadrant represents the absence of a theorized notion of interaction design and the gap that the theory here aims to fill. Based on our discussion, the broad outlines of an interaction design theory would be similar to Schön’s reflective practice and Kaptelinin and Nardi’s theory of post-cognitive HCI in that the theory would balance a descriptive/explanatory theoretical outlook with a revisionary one.