CHAPTER 1

Introduction

The world is messy, fuzzy, sticky,
theoretically 'tis all quite tricky. (Tom Erickson, 2002)

1.1 BURGEONING HCI

The field of human-computer interaction has burst its seams. Its mission, raison d'être, goals and methodologies, that were established early on, have expanded and dissolved to the point that "HCI is now effectively a boundless domain" (Barnard et al., 2000, p221). Everything is in flux, arguably, more so than ever before: the theory that drives research is changing, a flurry of new concepts have emerged, the domains, topics and user experiences being studied have diversified; many of the ways of doing design are new and much of the technology and user experience that is being designed for, in terms of platforms, applications, services, ecologies, etc., is significantly different from ten years ago. The focus is no longer about human-computer interaction *per se*, but more about "the creation of intuitive, simple, transparent interaction designs which allow people to easily express themselves through various computationally enhanced tools and media." (Bannon, 2011a, p17). These changes reflect and capitalize on the rapid advances that have occurred in computing and computation (see Grudin, 2012, for an extensive historical overview of HCI and related fields).

While potentially much is to be gained from such burgeoning growth, the downside is a worrying lack of direction, structure and purpose in the field. What was originally a confined problem space with a clear focus that adopted a small set of methods to tackle it — that of designing computer systems to make them more easy and efficient to use by a single user — has now turned into a more diffuse space with a less clear purpose as to what to study, what to design for and which methods to use. It is now widely accepted that a specific problem space does not have to be identified, but an opportunity to design for the unimagined and possible, is suffice. Moreover, global challenges that previously were considered the realms of government and politics are now being promoted as major research topics for HCI, for example, reducing global poverty through social media, mobile and other technologies (see Shneiderman, 2011). At the same time, some have moved into uncharted territories where even taboo subjects are analyzed. Many more topics, areas and approaches are being published in HCI venues, including technology-enhanced sex, religion and food.

It is inevitable for a field that has become increasingly concerned with society, everyday living and progress to have growing pains. A danger, however, of a nascent field, growing so fast and without checks, is it spiraling out of control. There is no longer a consensus of its purpose or indeed what criteria to use to assess its contribution and value to knowledge and practice. No sooner does

an official body, such as the ACM, derive a charter for HCI, it is out of date. For example, the definition of HCI prescribed by ACM's SIGCHI on its website (SIGCHI, 2012) is restricted to "the study and practice of the design, implementation, use, and evaluation of interactive computing systems," whereas there is much more happening in HCI today — judging by what is presented at conferences, workshops, etc., and discussed in the blogosphere. Do we try to stem the tide and impose some order and rules or let the field continue to expand in an unruly fashion?

Is HCI now CSCW, Human Factors and Ubicomp, too?

Human-computer interaction (HCI) is generally accepted as the umbrella term for a field that includes and overlaps with several other fields and areas (see Figure 1.1).

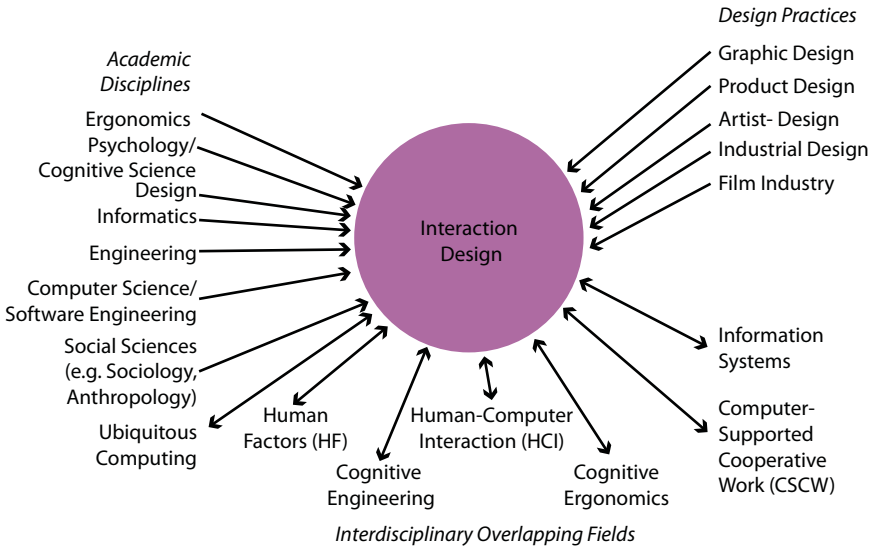

Figure 1.1: The relationship between contributing academic disciplines, design practices and interdisciplinary fields concerned with interaction design (from Rogers et al., 2011).

The initial vision was of an applied science that could use cognitive science theories and methods to inform the development of software (see Carroll, 2003). The goal was to understand how people make use of computational

systems and devices and how they could be designed to be usable and useful. Since its inception, several other fields and approaches concerned with people, design and technology have emerged, some splintering from HCI and others evolving from different disciplines; these include CSCW, Ubicomp, cognitive ergonomics, social computing and interaction design. The difference between these and HCI is largely one of focus, in terms of the different methods, philosophies and lenses that are used to study, analyze, and design computers. Another is the scope and problems they address, where specific kinds of topics may be emphasized. For example, Information Systems is concerned with the application of computing technology in domains like business, health and education, whereas Computer-Supported Cooperative Work (CSCW) broke away from HCI's single user unit of analysis, at the time, to focus on how to support multiple people working together using computer systems (Greif, 1988).

While the newer fields have carved out their distinctiveness in terms of framing, rhetoric and identity to set them apart from each other and HCI, HCI keeps recasting its net ever wider, which has the effect of subsuming them. For example, the topics covered by many papers that first appeared in a CSCW or an Ubicomp conference are now equally at home in the ACM's CHI conference. While it is in the interest of the "other" fields to maintain their distinct boundaries and separateness from HCI, HCI does not have to reciprocate. Its tendency towards inclusiveness means it will continue to expand, sometimes at the expense of others losing ground.

In an attempt to pin down a definition that reflected the changes a foot in the field, Jenny Preece, Helen Sharp and myself chose the title *Interaction Design: Beyond HCI* for the three editions of our textbook (Preece et al., 2003; Rogers et al., 2011; Sharp et al., 2007). We considered the term Human-Computer Interaction was no longer representative, with its focus on a single user and computer. Instead, the more general term "interaction design" was considered to be more encompassing, covering a wider range of design, people (sic) and interaction aspects: "designing interactive products to support the way people communicate and interact in their everyday and working lives." (Rogers et al., 2011, p9) But even this definition misses out on much of the day-to-day practice of interaction design, both in academe and industry. In particular, it fails to capture recent trends, for example, of putting human values first, such as ethics (Harper et al., 2008) and moves towards doing research "in-the-wild" (Rogers, 2011).

1.2 CONCEPTUALIZING HCI: FROM PARADIGMS TO FRAMEWORKS

A number of sources of inspiration and knowledge have been used to inform design and guide research in HCI, including paradigms, theories, models, frameworks and approaches (Carroll, 2003; Rogers et al., 2011). These vary in terms of their scale and specificity to a particular problem space. At the highest level is a *paradigm;* this refers to a general approach that has been adopted by a community of researchers and designers for carrying out their work, in terms of shared assumptions, concepts, values and practices. At the next level is a *theoretical approach* or *perspective* that refers more generally to the assumptions about a phenomenon being studied or designed for, the lenses used to analyze it and the questions asked, that are grounded in a theoretical tradition, for example, within social psychology, design or engineering. A *theory* is a well-substantiated explanation of some aspect of a phenomenon, for example, the theory of information processing that explains how the mind, or some aspect of it, is assumed to work. A *model* is a simplification of some aspect of HCI, intended to make it easier for designers to predict and evaluate alternative designs. A *framework* is a set of interrelated concepts and/or a set of specific questions that is intended to inform a particular domain area, e.g., collaborative learning, online communities or an analytic method, e.g., ethnographic studies. A number of frameworks have been introduced in HCI to help designers constrain and scope the user experience for which they are designing. They can come in a variety of forms, including steps, questions, concepts, challenges, principles, tactics and dimensions. For example, there are frameworks for helping designers think about how to conceptualize learning, working, socializing, fun, emotion, etc. and others that focus on how to design particular kinds of technologies to evoke certain responses, e.g., persuasive technologies and pleasurable products.

HCI Paradigms

In general, a paradigm provides a set of practices that a community has agreed upon (Rogers et al., 2011). These include:

- questions to be asked and how they should be framed;
- phenomena to be observed;
- how findings from studies are to be analyzed and interpreted.

In the late 1970s and 1980s, the prevailing paradigm in human-computer interaction was how to design user-centered applications for the desktop computer. Carroll (2003) talks about this first decade of HCI as the Golden Age — in the sense that there was a general agreement about what it was about, what it strove for and what it could achieve — which it turns out was considerable. Questions about what and how to design were framed in terms of specifying the requirements for a single user interacting with a screen-based interface. Task analytic and usability methods were developed based on an

individual user's cognitive capabilities. The acronym WIMP was used as a way of characterizing the core features of an interface for a single user: this stood for Windows, Icons, Menus and Pointer. This was later superseded by the GUI (graphical user interface), a term that has stuck with us ever since. Within interaction design, many changes took place in the mid-to-late 1990s. The WIMP interface with its single thread, discrete event dialog was considered to be unnecessarily limiting (e.g., Jacob, 1996). Instead, many argued that a new paradigm was needed to enable more flexible forms of interaction to take place, having a higher degree of interactivity and parallel input/output exchanges. A shift in thinking, together with several technological advances, paved the way for a new way of conceptualizing human-computer interaction. The rhetoric "beyond the desktop" became a pervasive starting point, resulting in many new challenges, questions and phenomena being considered. New methods of designing, modeling, and analyzing came to the fore. At the same time, new theories, concepts and ideas entered the stage. Weiser's (1991) vision of the future also provided an alternative paradigm in the field of ubiquitous computing.

To summarize, paradigms, theories, models and frameworks are not mutually exclusive but overlap in their way of conceptualizing the problem and design space, varying in their level of rigor, abstraction and purpose. Paradigms are overarching approaches that comprise a set of accepted practices and framing of questions and phenomena to observe; theories tend to be comprehensive, explaining human-computer interactions; models tend to simplify some aspect of human-computer interaction, providing a basis for designing and evaluating systems; and frameworks provide a set of core concepts, questions or principles to consider when designing for a user experience. Within HCI, many researchers attempted to develop different kinds of conceptual tools that could be applied to HCI and interaction design.

But as the new approaches, ideas and theories proliferate within HCI, it can make it problematic for those inside and outside to know what are the current acceptable, reliable, useful and generalizable findings and advances in knowledge. Researchers and designers, alike, also find it more difficult to say with confidence what HCI is, and to know which of the many tools and techniques to use, when doing design and research. The criteria available for them to help make systematic judgments are often disparate, and many a student may select a technique, theory and set of methods on a "pick and mix" basis. Some might argue that such arbitrariness does not matter so long as the outcomes of HCI can be shown to have an impact on society that is supported by evidence. Others, however, feel uncomfortable that the field is losing its rigor and reason.

Nearly ten years ago I addressed these concerns in an extensive review paper about the impact of the then recent developments of theory in HCI practice, by taking stock and reflecting on the numerous changes that were happening (Rogers, 2004). I critiqued the seminal theoretical devel-

opments of the time, assessing and ruminating more generally on the role of theory in HCI. A core concern running through the review article was the extent to which theory was used in design practice. I noted how a diversity of new theories had been imported and adapted in the field. A key question I raised was whether these attempts had been productive in terms of knowledge transfer. By knowledge transfer, I was referring to the translation of research findings (e.g., theory, empirical results, descriptive accounts, cognitive models) from one discipline (e.g., cognitive psychology, sociology) into practical concerns that could be applied to another (e.g., HCI, CSCW). An empirical study of designer's use of theory that I conducted made for rather depressing reading, especially for those championing theory in practice (Rogers, 2004). Despite designers' perceived need and desire for applying theory, they reported in the survey that they were only able to make use of some of it in a limited way. I concluded by proposing new knowledge transfer mechanisms, including a lingua franca that designers and researchers, alike, could use to talk to one another more.

1.3 AIMS OF THE BOOK

So what next? The purpose of this book is, firstly, to revisit the concerns surrounding the role of theory in an applied and rapidly changing field, by examining its place and value in the field in the interim years. Secondly, to consider the ramifications of this for a field that has become everything and anything, in an attempt to keep up with, understand and be part of a technology-pervasive world that is radically transforming how we live. Thirdly, to discuss what it means for the advancement of a field and its knowledge where its theory industry has become so multifarious.

Clearly, it is impossible to do justice to all the theories that have been imported and written about in HCI (and overlapping disciplines) in one book. There is inevitable bias in what is covered here; some theories are covered in depth, while some are briefly touched upon (such as those in CSCW and cognitive ergonomics). My objective here is to provide an overview of the theoretical developments, but to give more space to those that have been most influential in HCI (e.g., Distributed Cognition, Activity Theory), providing more in-depth discussion of their use and impact. For each theory, I describe how it has been imported, adapted and its impact on research and practice. I have also included a number of approaches that are not considered to be theoretical but are *methodological* in nature. The reason for their inclusion is that they have played an integral part in other theoretical developments within HCI. These are primarily grounded theory and ethnography and I have also included *approaches* that are considered largely or wholly *atheoretical*, namely, ethnomethodology and situated action. These were included because of their impact. Besides being influential in shaping the field, they have often been highly critical of existing theories in HCI, and alternatively, promoting radically different ways of framing human-computer interactions, phenomena and data.

As Grudin notes (personal communication), a *method*, such as an experiment or observation, is not a theory. However, the outcome of using a method to collect data is often used as input for theory construction or theory testing and hence, in my view, it is important to consider methods in relation to theory. While it is generally accepted that there is a distinction between method and theory, it is argued that they are intertwined, especially in terms of how they are used and developed

in HCI. Hence, my position in this book is to adopt a broad-brush approach to theory in HCI. Instead of restricting myself to using the term "theory" in the narrow scientific tradition, I have chosen to show how theory, in all its forms and guises, has been adapted and contextualized in HCI practice.

1.4 PARALLELS WITH ART HISTORY

To frame the history of HCI theory, I borrow, loosely, from the periodization of the History of Art, characterizing it in terms of three parallel movements: Classical, Modern and Contemporary. I critique *Classical* theoretical developments and the role they have played in the field, followed by an overview of *Modern* and *Contemporary* theories. Previous attempts to characterize the history and the significant developments in HCI have conceptualized them more generally in metaphorical terms of waves, paradigms or circles (e.g., Bødker, 2006; Grudin, 1990; Harrison et al., 2007). My intention of adding yet another framing to the mix — this time as parallels to epochs in the History of Art — is to provide a different historical lens, which, I think, lends itself to understanding the way different theories have come and gone, and the zeitgeist behind their development. The parallel with the History of Art is at the level of distinctive periods, such as Classicism and Modernism that denote the style and philosophy of the art or theory produced during each of them.

Classical Art began with the Greeks and Romans and their interpretation and formal representation of the human form and the environment in which it exists. It adheres to artistic principles and rules laid down by painters and sculptors. Much training was required to become an artist of classicism. Well-known movements included Gothic, Baroque, Flemish and Pre-Raphaelite. Modern art took over in the late 19th century and lasted until the 1970s. This period is associated with art in which the previous classical traditions were thrown aside in the spirit of new ideas and experimentation, rethinking the nature of materials and the function of art. Notably, there was a move towards *abstraction*. For instance, Henri Matisse, Georges Braque, André Derain and Raoul Dufy totally transformed the Parisian art world with wild, expressive landscapes and figure paintings. Contemporary art then emerged in the 1960s/70s and is still with us today as the dominant movement. There are many different kinds of contemporary art, including well-known ones such as pop art, performance art and postmodern art and more obscure ones such as VJ art, cynical realism and superstroke. Collectively, contemporary art is considered to be more self conscious and socially conscious than previous eras, concerning itself with popular culture and political developments of the time, including feminism, multiculturalism and conceptualism.

Similar to these three periods of art history, the defining spirit or mood of the three eras of HCI theory can be viewed as being underpinned by the ideas and beliefs of the time. The Classical HCI period imported cognitive theory in a rigorous and constrained way; the Modernist HCI period saw a broader and colorful palette of approaches and uses of theory — from social, phenomenological and cognitive science — while the Contemporary period became more value-led, drawing from a range of moralistic and societal-based perspectives. Each has significantly extended the discourse of HCI research.

However, at the same time, many of the theoretically based approaches that have been promulgated in each period have had only a limited impact on the *practice* of interaction design. Why is this so? The book discusses this dilemma and concludes that HCI theory is now at a crossroads. It can continue to address moderately sized issues (i.e., small HCI) or it can try to tackle even bigger challenges (i.e., big HCI). While modernist theories can continue to deal with micro HCI, having an input into the design of new experiences and technologies, different kinds of theories are needed to better articulate and ground macro-HCI, to encompass the complex challenges facing society (Shneiderman, 2012).

In the next chapter, I provide a brief overview of how HCI grew alongside the technological developments that were taking place. In Chapter 3, I summarize the various roles and contributions theory has made to HCI. Then in Chapters 4, 5 and 6, I provide an overview of the three periods of HCI theory. Chapter 7 discusses the reasons behind the success and failures of theory being applied in practice. Finally, Chapter 8 looks to the future, asking where theory will go next.