

## Preface: Innovation in HCI- What Can We Learn from Design Thinking

### Innovation in HCI

The importance of innovation can hardly be understated. As observed by the open innovation theorist Chesbrough, “companies that don't innovate die” [6]. Few areas exist where this is more evident than in that of designing and developing interactive systems. Here, in less than three decades, we have seen extreme changes in consumer and corporate markets following the transition to networked devices everywhere and anytime. With the rise of big data, artificial intelligence, and social robots, even greater changes may lie ahead.

Hence, it is more than a little disturbing when acknowledged theorists in the field of human-computer interaction (HCI) question the capacity for innovation within their own field. HCI is a cross-disciplinary field concerned with how interactive systems should be designed and developed to be useful, efficient, pleasant and engaging to human users [22]. In spite of the multiple branches and sub-disciplines that do exist within HCI, researchers and practitioners typically agree on a user-oriented approach where design is seen as a response to elicited or refined user needs and requirements. As such, the HCI design and development process is an example of an iterative engineering process, where the design is gradually improved by a growing understanding of the users and the context of use [22].

Recently, two leading HCI theorists, independently of each other, have voiced their concern with the current state of the field. Bill Buxton, first in a text book on user experience design [4], then in a CHI paper written with Saul Greenberg [13], argued that usability engineering, one of the many sub-disciplines of HCI, typically fails to support the design of really new products. Though usability engineering may well support incremental improvement, through reiterating user requirements and evaluations with users, it may be counter-productive to breakthrough innovation as users may neither ask for nor appreciate early prototypes of really new design solutions [13].

Donald Norman, the author of the seminal *Design of Everyday Things*, made a similar point to that of Buxton. In a much debated *interactions* opinion piece [19], he argued that technology developments, not users needs carefully established through HCI research, drive innovation in interactive systems. A few years later, pairing up with Roberto Verganti [20], he extended this point. While HCI approaches to design - termed human-centered design by Norman, to the potential confusion of anyone from a design thinking background to whom human-centered design may hold other connotations (e.g. [12]) - are considered well suited for incremental improvements, these are not considered suitable drivers of breakthrough innovation. For the latter, Norman and Verganti argue, new technology or changes in meaning are needed.

The concerns expressed by Buxton and Norman, have motivated others to elaborate on the current state of innovation in HCI. Frolich and Sarvas [11] argue that the lack of attention to business models and technology diffusion may hinder HCI practice from generating breakthrough innovation. Chilana et al. suggest that the preoccupation with rigor and generalizability within HCI may obstruct concerns pertaining to relevance and market orientation [7]. Lindtner et al. observe that innovation in human-computer interaction increasingly is conducted outside HCI as a research discipline [17].

## **The promise of design thinking**

While researchers and practitioners within the field of HCI debate the innovation challenge, design thinking has emerged as a field of human-centered research and practice where breakthrough innovation is a stated aim [2]. Design thinking is seen as an approach to problem solving in situations characterized by insufficient problem definitions, confusing information and conflicting values, so called *wicked problems*. The design thinking approach is often contrasted to linear problem solving where problems are first analyzed and specified prior to incremental or synthetic problem solving [3].

Indeed, design thinking no more than HCI can be seen as a uniform field of research and practice. Cross [9] considers design thinking in the context of individual designers. Lockwood [18] highlights design thinking as a framework for collaboration. Brown [2] stresses the importance of involving and empathizing with users, or customers, as part of a design thinking approach. Meinel and Leifer [21] present design thinking as a methodology to support non-designers in innovation. What emerges as a common view of design thinking characteristics among these theorists and practitioners is an acknowledgement that problems are inherently under-determined, a willingness to challenge existing preconceptions, a drive to explore multiple new directions through sketches, tangibles, visualizations or prototypes, and a drive towards suggesting alternative solutions rather than refining problem specifications.

Kimbell [15], summarizing much of the previous work, discusses design thinking as a cognitive style, a theory of design, and a resource available to organizations aiming for innovation or change. She observes how design thinking, while starting out as a research endeavor to understand design, has recently turned into a framework to support innovation and change through an iterative, human-centric approach. This turn is, for example, seen in the work of Carlgren et al. [5] who in an interview study of large organizations find that these may benefit from design thinking both in terms of outcome-related aspects, such as new ideas and products, and organizational aspects, such as competencies, processes, and mindset.

The promise of design thinking as a framework to support innovation is highly intriguing from an HCI perspective; in particular, given the human-centricity accentuated in the more recent take on design thinking. How is it that a field of research and practice that shares so many important characteristics with the field of HCI, such as a particular concern for a human-centric, iterative approach to design

and development, may be said to differ so fundamentally in terms of its capacity to support innovation?

Motivated by this question, we in 2014 organized a workshop on innovation in HCI, specifically addressing what HCI may learn from design thinking [10]. The presentations and practical exercises during the workshop suggested several answers as to the relative strength of design thinking for breakthrough innovation. Among these, we found the drive towards an early exploration of multiple new directions and the willingness to challenge preconceptions and problem definitions seen in design thinking to represent refreshing contrasts to the precise analysis and linear solving of problems that is often seen among HCI researchers and practitioners. Motivated by our workshop experiences, this focus section came into being.

## **Designerly thinking in HCI**

Though we find that the field of HCI has much to learn from design thinking, we are by no means the first to explore this.

While HCI has always been linked to design in some form or other, types of design practices supported by, or integrated into HCI, have undergone important changes over the lifetime of this tradition. As argued by Wright et al. [24], in its formative years the field of HCI was strongly dominated by an engineering approach to design. Design was typically seen as a process involving a detailed problem statement in the form of a requirements specification, and an analytical approach to the solving of the design problem through a series of well-defined steps. Following a turn towards user experience, this engineering-approach to design has been challenged [24]. Nevertheless, the notion of the design process being constituted by a set of clearly demarcated steps is still prominent within the field of HCI, as is, for example, seen in the relevant international standard on human-centered design [14].

Among the researchers that have worked to place design and designerly way of thinking on the research agenda of HCI are Stolterman and Zimmerman. Zimmerman et al. [25], resonating the argument of Wright et al., observe that “the HCI community has struggled to integrate design in research and practice” (ibid, p. 493). In particular, they argue, there has been a lack of support for appreciating design as a holistic approach to under-determined problems.

In a similar vein, Stolterman [23] points out that the way design is addressed in science in general, and in HCI research in particular, is not helpful to practical design. While HCI researchers may aim for design methods to support findings and conclusions that are generalizable across different contexts, practitioners of design need to find a particular solution within a specific context. The way complexity, contextuality, and particularity are dealt with within HCI research may be seen as the opposite of a designerly way of thinking [23].

Other HCI researchers have addressed the limitations of design as a practice within HCI, without explicit reference to designerly thinking. For example, Cockton [8] parodies the concern for user-research and evaluation in HCI at the cost of purposeful design, and argues that HCI in general, and user-centered design in

particular, should aim to benefit from the knowledge and experience of other design paradigms.

## **The contributions of this focus section**

The papers included in this focus section shed light on different aspects of how HCI may learn from design thinking, to strengthen our field's propensity for driving innovation and change. The call for contributions was wide, and consequently, received contributions representing different perspectives on what can be learned from design thinking. The three papers selected for this focus section illustrate three such perspectives.

First, Mulder presents how design thinking can be incorporated into a pedagogical framework to renew HCI education. In this approach, design thinking is used to leverage a cross-disciplinary collaboration between research, government, industry, and both HCI and design education. At the heart of the framework is the idea of a *chaordic* research and learning environment that integrates the structure (order) and a creative mess (chaos) needed in design and innovation. The framework is applied in research and education through Applab, a lab that aims to participate in solving real city challenges. The paper shares the framework, as well as the lessons learned from applying it.

In the second paper selected for this focus section, Pandey discusses *design proto-practices*. A design proto-practice is a way of working with design thinking that allows for the translation and application of design thinking practices in the context of an organization, thus enabling the emergence of new practices within the organization. Many organizations have a strong resistance to change, especially so if they have well established and deeply rooted existing organizational practices. Design proto-practices are presented and discussed as a way of lowering resistance to change and enabling novel innovation-oriented practices that are sustained over time. Building on theoretical guidelines from practice theory, organizational studies and HCI literature related to practices, learning and innovation, a framework for establishing proto-practices is presented and illustrated through a case of proto-practice emergence in an academic library.

In the last paper included in this section, Thies reflects on the use of design thinking in complex contexts, such as that of healthcare. By presenting a rich case, based on direct observations in the field, Thies discusses a need to take a more holistic approach when trying to solve problems in this complex context. The case presents a situation with a dysfunctional booking system for doctor's appointments, and looks beyond the re-design of the booking system, allowing for the messiness and complexity of underlying actions, interactions, and workflows to emerge in an attempt to identify deeper issues that need to be addressed. This case illustrates well the discussion in this preface.

In general, from all the papers submitted for the focus section, we could easily recognize alignment with the fourth wave of HCI [1] and its cross-disciplinary nature. The submitted papers also clearly reflected a transition, also in HCI, to design for complex domains, real life contexts and solving problems with meaning [16].

We find that the HCI community can learn a range of lessons from design thinking. Three important ones are communicated through the selected papers: 1) a holistic lens is important when identifying problems in complex domains, 2) not only technology but also practices, even the HCI education, can become a design material 3) iterative or radical innovations are not goals in and by themselves. As HCI moves into the fourth wave and away from design of single interfaces towards design ecologies, large contexts and infrastructuring, it naturally draws closer to design thinking in complex systems, and thus, increased relevance of both incremental and radical innovations that hold promise of influencing our everyday lives positively.

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