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Contemplating human-centred security & privacy research: Suggesting future directions



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ABSTRACT

This position paper is a reflective look at the state of Human-Centred Security & Privacy (HCSP) research and the paradigms that have informed and driven the research. It is important to reflect and examine, because, as Harrison et al. [1] argue, with respect to HCI, “the lack of clarity about the epistemological distinctions between paradigms is a limiting factor in the development of the field” (p. 1). We discuss the current state of play and then suggest possible explanations and suggestions for the way forward for our research field. This paper aims to prompt a discussion of the directions HCSP should take, and ways we could deploy to encourage maturation of the field.

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1. Introduction

The field of *Usable Security* emerged at the beginning of the 21st century, launched in 1999 by the seminal paper by Adams and Sasse [2], which pointed out that end-users were not the enemy. Before this, the end-user was somewhat derided for his/her poor password choices and non-compliance with good password practice. Their paper was one of the first to suggest that the usability of security technologies and tools deserved serious attention.

The new branch of human-computer interaction (HCI) focusing on security thus came into being. It soon embraced privacy as well. The emerging field of what we will call “*Human-Centred Security & Privacy*” (HCSP) has since become established, reflecting the acknowledgment of the crucial role the end-user plays in securing information and systems. Today, in 2016, a number of workshops and conferences specifically call for human-centred security and privacy related papers (See [Appendix](#)).

In order to predict how the HCSP research field might, and ought to, mature, we will first examine the development of its parent field: HCI. We then compare the progression of HCSP with HCI, and suggest explanations for the current focus of HCSP research. We conclude by suggesting how the field ought to develop in order to ensure that we make the same impact HCI has made on people’s everyday lives.

2. Human computer interaction

Myers [3] argues that the HCI field was launched in 1960 with the development of direct manipulation of graphical objects. Carroll [4] pins the birth of HCI, with an end-user rather than hardware focus, to the 1970s. The original focus, he argues, was pure *usability*. Carroll says the initial HCI stalwarts appeared to be propagating a heretical view, and had to fight to establish HCI as a serious research area. Now, Carroll says, “*HCI is a vast and multifaceted community, bound by the evolving concept of usability, and the integrating commitment to value human activity and experience as the primary driver in technology.*”

Whereas Carroll and Myers chart the development of HCI in small steps Bødker [5] takes a broader view, referring to HCI’s progress as a succession of *waves*.

The **first** wave, she explains, focused on the individual. The individual’s perceptions, cognition and behaviours were tested and modeled.

The **second** wave moved from studying the individual to contemplating social behaviours, agency and interactions within workplaces and with others via technology. The focus moved to groups working with applications. Instead of studying the human, the researchers now studied work settings. Context and situational analysis came to the fore.

The **third** wave then broadened the focus even further to incorporate studies of the integration of technology into people’s everyday lives. Now researchers started to talk about user experience and meaning making. Technology becomes the extension of the individual, with the boundaries between the individual and

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the technology blurring. The third wave coincided with the diffusion of mobile devices, and the vastly increased functionality in the hands of every person. Social networking sites also entered the fray and offered a whole new area for research. Researchers, during this wave, started to make the point that it was necessary to study technology use *in the wild* [6]. Korn and Bødker [7] argue caution in terms of testing in the wild; saying that technology should not merely be dumped on people. They urge the combination of participatory prototyping, experiments and in-the-wild studies.

Harrison et al. [1] takes a similarly high level look at HCI, and proposes three different paradigms, the first being engineering research. This was characterised by the design of cockpits to reduce pilot errors, for example. Harrison et al. argue that the next paradigm was the cognitive revolution. They argue that this paradigm was dominated by the idea of humans as information processing units. The third paradigm, they explain, came from the realisation that the information-processing paradigm did not match all cases. The new paradigm embraced the construction of meaning, as it occurs while people interact with technology. It also incorporated the realisation that people's understanding and behaviour is informed and influenced by their context, their physical and social situations. They also refer to the need to study humans creating meaning from multiple perspectives and for design to be focused primarily on values.

In 2015 Bødker returned to her wave theme 10 years after her original keynote [8]. She reviewed progress over the last 10 years and says that the challenge is to “go beyond embracing individual experience as it develops over time when people carry out activities and use artifacts”. She holds back from predicting the arrival of a fourth wave, concluding that HCI is somewhat chaotic at present with a mishmash of technologies, use situations, methods, and concepts characterising current research in the field [8].

Bødker [8] argues for the fact that the making and sharing of meaning is essential. She laments the fact that much research does not make it clear how it benefits people, or impacts their lives, or, indeed, what the meaning of the research is to the man and woman in the street. The lesson to be taken from Bødker is that a field has to mature to achieve its full potential.

HCSP seems to have less of a challenge in demonstrating the impact of their research, since improvement in individual security is obviously a desirable outcome. We propose to take a meta view and to consider how to ensure that this happens.

3. Examining HCI research

In order to determine whether the papers published in the HCI field reflect these waves, we took three snapshots of the CHI conference (Human Factors in Computing Systems), the top HCI conference, for three years: 2004, 2010 and 2016. We did not snapshot all the interim years since Bødker [5] gave her keynote. Since CHI is an established and mature conference we expected to see changes manifesting over longer periods of time than for younger conferences which have not yet stabilised.

A qualitative judgement was made based on the titles of the conference papers and then we classified and quantified the papers based on our understanding of the three waves before generating the graphics. A total of 1600 titles were analysed. It is thus possible that a detailed perusal of the papers could have led to a different classification but, since the title is meant to encapsulate and describe the content, it seemed to be a reasonable signal to judge the paper's focus. We categorised the papers as belonging to one of the three ‘paradigms’ or ‘waves’ as follows:

First Wave: The focus of the paper was the *individual*, as participant, agent or unwitting actor.

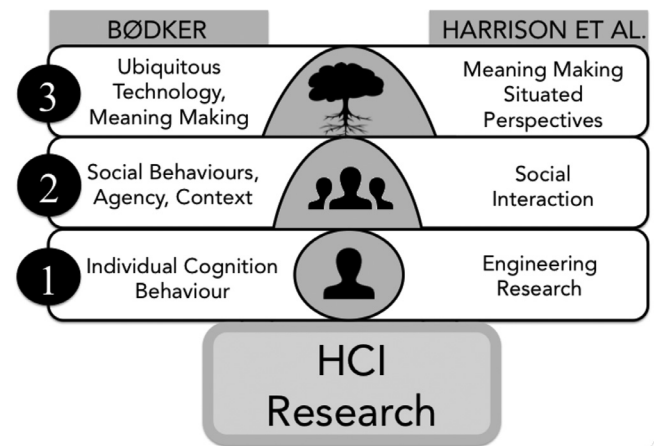


Fig. 1. HCI Waves of Maturity.

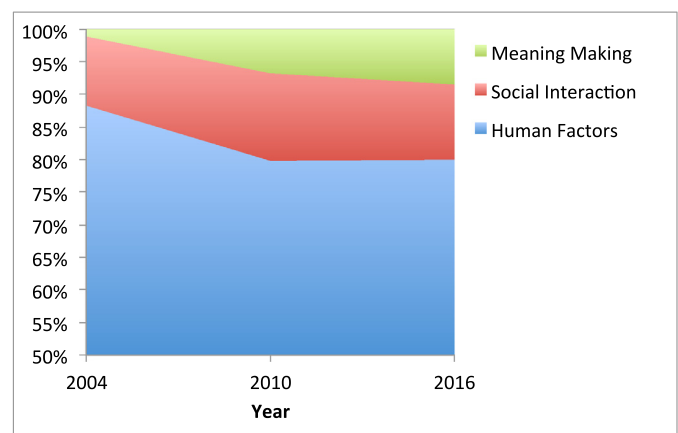


Fig. 2. CHI Papers over three years (Note that Y axis starts at 50%).

Second Wave: The focus here was on the *social context*: software that facilitates and supports collaboration and interaction. The distinction here was that the focus is on the software that enables collaboration, not on the individual's use thereof. In this category we included studies of participative design, and studies of the use of technology within a particular context or culture. It should be noted that the study's focus should not be on the individual user as agent, but rather on the context and social aspects of the situation.

Third Wave: What distinguishes this wave are two types of focus. The first is ubiquitous computing, and how people integrate various devices and technologies into their lives. The focus has moved on examining and revealing to the *meaning* of the interaction. Other studies that try to make meaning are included here. Examples are studies that take a meta view of a particular aspect, or studies that analyse a number of research studies and extract principles for design.

The graph in Fig. 2 certainly appears to confirm the emergence of the waves Harrison et al. [1] and Bødker [8] refer to.

4. Human-centred security & privacy

At present, the field of human-centred security & privacy (HCSP) is much younger than HCI. We took a snapshot of the research in the area by classifying all the papers accepted by the SOUPS conference (Symposium On Usable Privacy and Security) from 2012 to 2016. The choice of SOUPS was motivated by the fact that it was the first conference dedicated solely to this area.

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