

Post-cognitivist HCI: Second-Wave Theories

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ABSTRACT

Historically, the dominant paradigm in HCI, when it appeared as a field in early 80s, was information processing (“cognitivist”) psychology. In recent decades, as the focus of research moved beyond information processing to include how the use of technology emerges in social, cultural and organizational contexts, a variety of conceptual frameworks have been proposed as candidate theoretical foundations for “second-wave” HCI and CSCW. The purpose of this panel is to articulate similarities and differences between some of the leading “post-cognitivist” theoretical perspectives: language/action, activity theory, and distributed cognition.

Keywords

HCI theories, language/action, activity theory, cognitive approach, distributed cognition

OVERVIEW OF THE PANEL TOPIC

Information processing psychology was the theoretical foundation of the “first-wave” Human-Computer Interaction (HCI). The limitations of this paradigm were demonstrated in seminal books by Suchman (1987) and Winograd and Flores (1986), and by the early 90s they had been recognized by the mainstream HCI community.

A variety of conceptual frameworks have been proposed as candidate theoretical foundations for second wave HCI. They include activity theory (Bødker, 1991, Nardi, 1996), phenomenology (Winograd and Flores, 1987; Dourish, 2001), distributed cognition (Hutchins, 1995), grounded theory (Fitzgerald, 1999), and ethnomethodology (Suchman, 1987).

Currently these approaches are developing practically independently from each other. A recurrent topic in both papers and personal communications is the need to establish closer links between existing “contextual” approaches in HCI, since they often have similar concerns. Each of the approaches has its strengths and weaknesses, and cooperation between them could be of mutual benefit. We believe it is time to initiate and facilitate a dialog between existing theoretical frameworks that consider human-computer interaction and computer-supported collaborative work as real-life practice of people situated in social and cultural contexts.

PANEL FORMAT

The aim of this panel is to articulate similarities and differences between some of the current post-cognitivist theoretical approaches in HCI: the language/action theory, activity theory, and distributed cognition. The panel will be organized as follows.

First, representatives of each of the above theories will (a) briefly present the basic principles of their approaches and

the relevance of these approaches for HCI and (b) take one other theory as a contrast and comment on the similarities and differences between the approaches. The contrasts will be balanced, so that each theory is commented.

Second, a general overview of the theoretical scene of post-cognitivist HCI will be given by one of the panelists (“the integrator”).

Third, the moderators will pose questions to the panel and the audience and a discussion will ensue.

SUMMARY OF PANELISTS' POSITIONS

Susanne Bødker (activity theory vs. language/ action theory)

(a) Activity theoretical HCI has come to focus on: (1) analysis and design for a particular work practice with concern for qualifications, work environment, division of work, etc., (2) analysis and design with focus on actual use and the complexity of multi-user activity; in particular, the notion of the artifact as mediator of human activity is essential, (3) focus on the development of expertise and of use in general, (4) active user participation in design and focus on use as part of design.

(b) Activity theory shares with the language/action perspective the fundamental notion that speaking cannot be detached from acting and that human cognition cannot be separated from this acting. However, activity theory unites the interpersonal aspects of acting through speaking (where language is a mediator) with a focus on acting on material objects. There is much more to acting in the world than speaking!

Jim Hollan and Edwin Hutchins (distributed cognition vs. activity theory)

(a) Distributed cognition relaxes the assumption that the individual person is the best or only useful unit of analysis and thus extends the reach of what is considered cognitive both to systems that are smaller than and to those that are larger than the individual. Distributed cognition provides an alternative to information processing psychology as a foundation for HCI. With its explicit attention to the ways in which cognitive processes can be enacted in interaction with the social and material environment, the phenomena most important to HCI are central to distributed cognition.

(b) Both distributed cognition and activity theory focus on socially-distributed, tool-mediated human performances. Both attend to the historical development of social and tool systems. However, while activity theory highlights “goals” of activities and identifies levels of behavior, distributed cognition emphasizes cognitive aspects of human performance. From a distributed cognition perspective, goals may be properties of institutions, but need not necessarily be properties of individuals. Distributed cognition, as a theory that aspires to address cognitive phenomena at any scale of organization, is still willing to lump together cases that activity theory long ago split.

Terry Winograd (language/action theory vs. distributed cognition)

(a) The language/ action theory centers around the linguistic interactions of two people in a “loop” of conversation that is based on commitments with specified “conditions of satisfaction” and is directed towards completion. The theory emphasizes the overarching structure of coordination of activity among people with inter-related activities and concerns. It correspondingly pushes out of focus the specifics of both the computer tools and the mental activities of the people involved. It does not deal with the many other effects of linguistic activity in conversations that are not structured towards completion of action. In this sense it is a partial theory, orthogonal to other theories dealing with what people think, how they are motivated, trained, and how they use specific tools.

(b) Distributed cognition theories emphasize these other dimensions, which are much less amenable to formalization and structured management. As such, it can provide valuable insights for the study of human behavior, which are not easily translatable into concrete computer-based interventions.

A meta-assumption in work that has been done on the language-action theory is that a theory is a kind of tool. It has specific uses for which it is well suited, and will be irrelevant for many other uses. The task to which language-action theory has been applied is in designing the structures for communication and coordination in work with computer support. Distributed Cognition has great value as a critical theory — one that illuminates and challenges assumptions about the mental structure of work, and can best be contrasted with traditional cognitive theories with their symbolic and hierarchical analysis of knowledge and tasks.

John Carroll (“the integrator”)

Activity theory, distributed cognition, and language/ action theory allow HCI researchers and designers to articulate and assess a wider range of critical factors than is countenanced by information processing theories. In retrospect, it is clear that such a broader theoretical foundation was required as HCI addressed issues in multimedia systems, computer-support cooperative work, ubiquitous computing, and so forth. We should expect the theoretical foundations of HCI to continually expand as the achievements and aspirations of the field move forward.

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