

Psychology and the User Interface: Science is soft at the frontier

(Abstract of invited talk)

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One source of intellectual overhead that every science inflicts on itself periodically is the clarion call to "be hard", to establish methodological ground rules so severe that they will insure that good science can prevail. This romantic notion would only be that if it were not for the fact that these fits of methodological purification have typically led to conceptual and empirical poverty. The excesses of positivism and its crippling effects on the sciences from physics to psychology are still in recent memory.

Newell and Card, in an invited article in the journal *Human-Computer Interaction*, have undertaken a modern variant of this methodological cleansing. However, in most respects their motivation and arguments are precisely those of the positivists. They urge that the psychology of human-computer interaction needs to be hardened, meaning it must more uniformly subscribe to parameter fitting, calculation, and quantitative approximation. They are explicit in identifying as their motivation the fear that the "harder" disciplines of user interface design and artificial intelligence will not take usability psychologists seriously unless the psychologists have hard methods. They suggest a modified Gresham's Law: "hard science drives out the soft," as if this is both inevitable and a good thing.

My own view is that science is always soft at the frontier. The psychology of human-computer interaction is at a frontier of method and theory in psychology and a frontier of technology and application in computer science. To me, it is fantastic to insist that we start right out on a "hard" psychological theory to guide designs for integrated co-authoring applications on workstations that support multimedia input/output when we can barely couch such a theory for well-worked, toy domains like cryptarithmic and chess.

Newell and Card are too concerned with the form of science and too little concerned with its content. They urge calculation and quantitative approximation but seem almost blase about what exactly is calculated or approximated. At best, Newell and Card's discussion is very premature; more likely, it threatens to set the psychology of human-computer interaction backward by confusing the project of developing

a fundamental understanding of usability and user psychology with the engineering practices we might be able to develop if we had such a science base to begin with.

This talk has four parts. In the first, I consider Newell and Card's clarion call for hard science, reviewing a critique developed jointly with Robert Campbell of IBM Research. Campbell and I argue: (1) that Newell and Card misunderstand and underestimate how psychology currently contributes to interface design and thus set out to solve a nonexistent problem; (2) that they misunderstand and oversimplify the system design process, and that indeed only by doing so can they find a role in it for their clumsy hard science; (3) that their replies to existent criticisms of their hard science are uniformly without serious content.

Their reply to the charge that their hard science is too low level is essentially to redefine "psychology" so that it perfectly coextends with their enterprise, leaving critics to attack psychology and not them. Their reply to the charge that their hard science is too limited in scope is to try to assimilate a variety of current work (much of it not so low level) to their enterprise merely by saying "it fills out our 'vision'." (Notably, these two replies, taken in conjunction, are self-contradictory). Finally, their reply to the charge that hard science takes too long to help at all in the development process is to say that the elaboration of interface technology in fact takes place more slowly than everyone thinks it does!

In the second part of the talk I examine some of the current research work in human-computer interaction that is paradigmatically hard. I argue that the psychology of human-computer interaction, like psychology generally, suffers from a methodological bias for posing elegant, either-or research questions that idealize away variables like task context, e.g., "is mouse driven pointing control better than a velocity control joystick?" Perhaps the question should be: "under what circumstance is a mouse the right design choice, and under what circumstance is a velocity control joystick the right choice?" Hard psychologists seem too willing to trade off ecological scale for laboratory tractability (e.g., a study of command languages that exam-

