Interaction Design for Complex Problem Solving

Barbara Mirel

Morgan Kaufmann   ISBN 1558608311 $44.95

Reviewed by Karen Landis

Interaction Design for Complex Problem Solving is not a standard "how-to" book, nor is it an "over the weekend" or "on the plane" read. Rather, it is a thoughtful, innovative approach to interaction design and a valuable tool to add to any specialist's arsenal.

The introductory examples Mirel has chosen for her book typify the style and candor of the rest of the text. She illustrates the broad range of complex problem-solving activities by discussing the military decision-making dilemma of one of the commanders in Tolstoy's *War and Peace*, the elements missing from Charles Minard's graphic of Napoleon's 1812 Moscow retreat, and the re-editing of the last scene of the film *Casablanca*. Her informal writing style makes the discussion of complex problems less daunting and more accessible. Her case studies

are descriptive and loaded with detail. These tactics pull the reader deep into the world of complex problem solvers, and help in explaining the challenges, frustrations, and difficulties they face. In the end, the reader emerges with a framework for thinking about, researching, and designing solutions for this group of users and their work.

To draw the reader into the world of complex problem solving, Mirel uses her first chapter to differentiate complex problems from well-structured tasks. She states, "Complex problem solving in general is nonlinear. Open-ended inquiry involves an evolving set of interlocking issues in constantly changing contexts. It requires knowledge from many different sources, and solutions require working in several disparate problem spaces. Answers are provi-

sional and emergent; various legitimate options exist to satisfy goals; and optimal choices depend on contextual circumstances" (p. 26). She suggests that the problem with traditional user-centered methodologies such as contextual design is that they focus only on a single context of use, while, in reality, users operate in numerous contexts: technical, social, organizational, perceptual, environmental, intellectual, and more. Designing for complex problem solving requires understanding the effect of this plurality of contexts on users' work methods. To support users with the degree of control and choice they need to work in these contexts, designers must supplement their focus on ease of use with a new concentration on usefulness. This requires focusing on "patterns of inquiry, associated task landscapes, and users' vari-

ous needs for 'structured freedom'" (p. 62).

Mirel offers a variety of strategies for designing for usefulness and gives designers ways to adopt them. These strategies are illustrated by several case studies—fictional but realistic composites of Mirel's experiences as a researcher and consultant. The first case describes the methods used by a design team to solve complex fault-troubleshooting of an IT infrastructure. We learn why the initial design solution didn't work, and follow the design team as they reformulate their solution to make it more useful and usable.

Subsequent case studies build on those that came before, and each increases in complexity. Decision-making to select an appropriate product-mix for a retail environment is followed by a case dealing with the administration of drug dosages for hospital patients. The case studies are well chosen so that the increase in complexity isn't limited to technical, interactive, and system-related problem solving, but also encompasses the sociopolitical and psychological dimensions. This discussion is welcome because these dimensions are rarely treated in the interaction design literature. Mirel presents a well-designed system as one that the user can't imagine living without in the virtual world of the computer, but also one that fits seamlessly into the

real world. This is especially challenging with complex problem solving where solutions are not known in advance.

The book emphasizes strategies that necessitate a shift in thinking from fulfilling lists of discrete features, functions, and procedural support to an emphasis on "integrated support for integrated tasks and designs that communicate to users the *structure* of problem-solving workspaces and information environments" (p. 232). Part of this involves moving the user beyond the metaphor of the desktop to an "electronic 'place,' not just a space" (p. 273). A sense of place is created when the workspace provides the user with a match between their virtual identity within the program and their perceived identity in the real world. The addition of features and fixes without first considering usefulness widens the gap between the electronic 'place' created by software and the work 'space' that people need. There will always be some disparity between the two, but that doesn't mean design teams can't lessen it.

When users' work resides in co-emergent systems, what is required for usefulness includes consideration of more than the integration of the systems. Designers must also take into account users' social practices, politics, and identity. Mirel notes, "In many cases, users' acceptance

of software hinges on the extent to which they find their roles, as structured by the software, to be politically acceptable" (p.305). She presents lists of perspectives design teams should follow, and pitfalls they should avoid (p. 329).

Mirel offers numerous illustrations and interface examples throughout the book. One method of analysis she refers to is the "task landscape" which appears to be a topological map of a mini-mountain range. The task trail moves up, down, and backtracks through a series of mountains with the highest peaks representing goals. These diagrams are intriguing but Mirel offers no explanation of how to go about constructing them. It is unclear how portions of the diagram were developed or what they symbolize. While providing references for the creation of these diagrams would have made their inclusion in the book more useful, it is possible that Mirel intended only to give a basic framework that designers can creatively mold and adapt. Rather than giving explicit directions that could have squelched the individual designer's creativity, Mirel has opened the door to productive exploration of this technique.

Since it may be difficult to shift organizations to a perspective that focuses on usefulness, the final chapter of the book is devoted to the politics and positioning of product usefulness within an

organization. Mirel explores a number of typical areas in which organizations have erected barriers that impede usefulness, and explores ways to break them down.

While this book is geared toward HCI specialists, it could benefit anyone who works with or is interested in user-centered design, including stakeholders, managers, programmers, and business analysts. It will certainly generate rich and meaningful discussion within a team. Keep a copy handy.

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