Making Computer Use Humane

Raymond S. Nickerson
Using Computers: The Human Factors
of Information Systems
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Review by
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Minds: Patterns of Experience in Educational Computing.

Nickerson has written a uniquely comprehensive and compassionate book about humans using computers. It will be broadly appealing because it informs and awakens the critical spirit, articulating challenges to psychology posed by computer use. Nickerson brings a well-reasoned and renaissancelike perspective to this complex interdisciplinary topic. Most important, he continually asks about the moral science of computation: "What can we do to increase the chances that the development and exploitation of this technology will contribute to the common good, to equity, to human dignity, and to the quality of life in general?" (p. 7). His treatment of these important issues is sensitive, for he is neither doomsayer nor technoromantic, but an optimist for research-informed shaping of the technology and its uses.

The author originally aimed at an audience of human factors researchers and engineering psychologists creating interactive systems for computer-novices. To this end, his broad critical synthesis of human factors studies of computing charts major findings and new directions for research to guide humane computer uses. He later broadened his readership to include anyone interested in characteristics and implications of the uses of computer systems in society. In a sense he has written two books in one. The technical audience can focus on the research synthesis; technology novices can learn about computers and their uses and, from the human factors review, may learn to ask critical questions about new information technologies.

Nickerson provides a sweeping, dramatic account of rapid advances in computer technologies and of how the information revolution has profoundly changed fields as diverse as farming, defense, and education while creating the global village. He effectively conveys the excitement and implications of new developments in resource sharing and networking, the tremendous significance of the merging of computer and communications technologies, and the advent of parallel-processor computing architectures that will bring supercomputer power to desktops within a decade. But at the core of his work is a valuable set of windows that he opens on the research literature in human-computer interaction. He does an excellent job of capturing valid inferences from experiments on the psychology of human-computer interaction in what is widely acknowledged as a murky field.

In chapters constituting half of the book, Nickerson describes methods for the study of person-computer interaction, issues and research involving the physical interface (mainly input-output devices) and the cognitive interface (focusing on information organization and presentation, input modes, and progress toward the use of written natural language or speech for computer interactions), and issues in and guidelines for designing usable interactive systems. He offers brief treatments of types of software tools, the psychology of programming, artificial intelligence, and expert systems. He also raises important questions and provides pertinent data and informed speculations about the impact of information technologies on jobs (e.g., office work) and on communication and information services. In an unusual chapter, he explores how information technologies might be used to better human life—to help overcome hunger and malnutrition, ignorance and illiteracy, and the crippling effects of disabilities.

This book invites comparison to two recent books on human-computer interaction (Card, Moran, & Newell, 1983; Norman & Draper, 1986). As a first book for the intelligent reader learning about people using computers, Nickerson's book is by far the most comprehensive and accessible. He explains fundamental ideas taken for granted as part of the vocabulary of professionals (to whom the other two books are directed). Unlike Card et al., Nickerson does not aim to offer a design guide for interactive systems. Instead, he provides a map of issues, controversies, and related research that should become part of the common sense of the interactive systems designer. And unlike Norman and Draper's book, this volume provides a user's guide to the research literature on using computers (including a 56-page bibliography). Like Norman and Draper, Nickerson recognizes the many moral responsibilities of the system designer who creates environments that will influence the way users think, what they think about, and how they feel about what they are doing.

One striking feature is the author's balanced presentation style for discussing different sides of complex and controversial research issues or making predictions of the computer's effects in the future. For example, will pervasive use of electronic messaging systems promote equity among users, or will such easy accessibility hamper productivity because workers will be flooded with mail? Nickerson often attempts to identify conditions under which it appears probable that the computer's effects will go in one direction or another.

He also documents important cases in which computers are promoting more than efficiency, enabling new methods of thinking, such as in mathematical, scientific, and statistical reasoning. The availability of mathematical problem-solving tools is already changing the nature of mathematics learning, and such potential effects throughout education call for systematic psychological study.

Nickerson could make improvements in the (inevitable) future editions of this classic work. It is a highly verbal book. There are only two figures, even though graphs, tables, or diagrams would aid the reader's understanding. Some parts of the book are less up to date than others. Nickerson devotes less than a page to videodisc and optical compact-disc imaging technologies, which are likely to revolutionize consumer electronics and data storage; he pays little attention to the explosive and important areas of machine learning and robotics. As well organized as the book is, because the field's subtopics are hard to define as chapters, the subject index becomes critical. Unfortunately, I found it sparse; I often could not find entries for key topics.

Two important topics deserve more treatment than they receive. Nickerson does not describe uses of computers as creative aids in art, architecture, music, and film. Another area of special interest concerns the problems in designing cognitive and physical interfaces for children's uses of computers. Nickerson devotes little attention to the need for developmentally sensitive human–computer interaction research with different age or knowledge-level groups.

The book will be widely useful, but it is the rare reader who will be interested in all of it, or who can understand it all. For example, an educational software designer might read the treatment of design guidelines for the cognitive interface with great interest, but might not have the physics background to understand descriptions of new computer components, such as Josephson junctions or optical transistors. The book seems to be more of a critical survey and reader's guide than a stand-alone book for instruction on any specific topic in detail. This fact is especially apparent in the thin discussions of such complex issues as knowledge representation and expert systems design architectures.

Nickerson raises many challenges to psychologists. Most have to do with the need to better anticipate possible negative and positive effects that computer uses might bring and to establish research knowledge that will guide the humane design and use of computers. Many issues stretch current psychological theory: How will parallel computing machines change the nature of theories of mind? How will the use of new problem-solving tools change the ways in which people think and the complexities of problems people are able to solve? Nickerson often spotlights psychologists as moral scientists

who should not stand by passively documenting the impacts of computers on people but should proactively work to define better roles for human–computer interactions. A great value of Nickerson's book is that it provokes prolonged thought about such matters. His balanced, humanistic treatment of the complex effects of using computers will stimulate readers to think anew about what they are doing and to provide the research

needed to make a world enhanced by technology, not bridled by it.

References

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