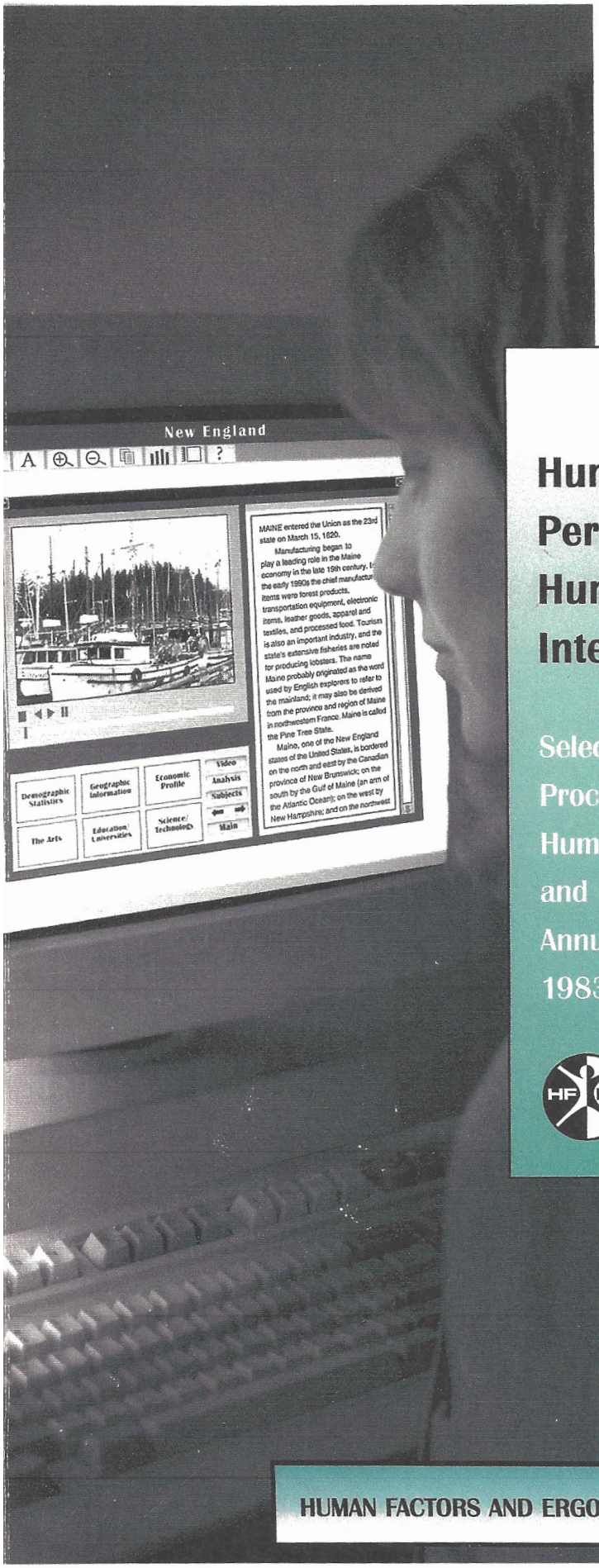


# Human Factors Perspectives on Human-Computer Interaction

## Selections from Proceedings of Human Factors and Ergonomics Society Annual Meetings 1983-1994

Edited by
Gary Perlman
Georgia K. Green
Michael S. Wogalter

HUMAN FACTORS AND ERGONOMICS SOCIETY

HUMAN FACTORS PERSPECTIVES ON

# HUMAN-COMPUTER INTERACTION

## Selections from Proceedings of Human Factors and Ergonomics Society Annual Meetings

This book contains some of the best, most useful articles on human-computer interaction from the proceedings of Human Factors and Ergonomics Society annual meetings from 1983 to 1994. It consists of 79 HCI papers that are reprinted in their entirety. Also included are author and subject indexes. Many professionals and researchers in areas related to HCI should have this book on their reference shelf. Even those who own full sets of the HFES annual meeting proceedings will enjoy the greater access made possible by this compilation. In addition, these articles can serve as readings for use in undergraduate and graduate HCI classes. Finally, this book might find its greatest utility in introducing newcomers to HCI research to the issues and the methods that can be employed to investigate them.

*— From the Preface*

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# Preface

This book contains some of the best, most useful articles on human-computer interaction (HCI) from the proceedings of Human Factors and Ergonomics Society (HFES) annual meetings from 1983 to 1994.

In the past dozen years, computer technology has advanced at a tremendous rate. Never has there been a tool (or, if you will, an appliance) so complex and flexible. In their infancy, computers were more difficult to use than they are today. There is no doubt that this trend toward increased usability will continue and that computers will be even more closely integrated into people's daily lives than they have become. Part of the increase in usability, in addition to technological advances, is attributable to research on people's interaction with computers.

Researchers and practitioners from many disciplines have contributed to the growing body of literature on HCI: computer scientists, psychologists, technical writers, designers, sociologists, and engineers. A substantial portion of the work has been carried out by researchers identified with the field of human factors and ergonomics. In the forefront of this research is the HFES Computer Systems Technical Group (CSTG). HFES is the largest scientific association in the United States concerned with issues of human-system interaction. Members include human factors specialists in academia, government, and industry. Research interests of CSTG members focus primarily on the interface between people and computer hardware and software, but some work has concerned closely allied areas, such as workstation design and lighting.

The fact that HFES proceedings have served as a primary outlet for publishing research and technical literature on HCI has resulted in a problem: People outside HFES have limited access to these articles. The proceedings are not widely distributed, and so those who might gain from them have difficulty obtaining them. Many on-line services that are used to access and retrieve references on various topics do not yet cover the proceedings. Although it is possible to search for HCI publications in the HCI Bibliography (located at ftp://archive.ohio-state.edu/pub/hcibib), that database contains abstracts, not full articles. Moreover, many libraries do not regularly receive the proceedings, a problem exacerbated by ongoing library budget cuts.

This collection was assembled in an effort to make some of the articles that have appeared in the proceedings more available. It consists of 79 HCI papers that are reprinted in their entirety. To include every potentially relevant paper would be unwieldy. Therefore, we selected those papers that were the most relevant to current HCI issues, and these were then reviewed by more than 50 CSTG members.

On the whole, we think this set of papers represents some of the finest work that has been done in the field. Many professionals and researchers in areas related to HCI should have this book on their reference shelf. Even those who own full sets of the HFES annual meeting proceedings will enjoy the greater access made possible by this compilation. In addition, these articles can serve as readings for use in undergraduate and graduate HCI classes. Finally, this book might find its greatest utility in introducing newcomers to HCI research to the issues and methods that can be employed to investigate them. We hope you find this collection useful and informative.

## Paper Selection

We considered papers from a number of technical sessions sponsored by HFES technical groups other than the CSTG. Papers relevant to HCI sometimes appear in sessions sponsored by the Aging, Communications, Industrial Ergonomics, Systems Development, Test and Evaluation, Training, and Visual Performance groups.

Some papers (e.g., abstract-only articles) were removed automatically, leaving 3,597 papers published between 1983 and 1994. Ratings were performed (see Figure 1), and unanimous agreement was reached to review 150 papers.

Reviews were conducted via electronic mail. Papers were assigned to reviewers randomly, except that known affiliations of reviewers and authors were used to avoid conflicts of interest in the review process. Reviewers received electronic forms with 7-point Likert rating scales to indicate whether they thought a paper should be included in the collection, based on whether or not the papers:

- focus on HCI, particularly designing and evaluating systems;
- address basic/important principles;
- represent work that continues to be useful (the work should not be dated); and
- have sound methodology and are well presented.

Reviewers provided additional information for the editors: Comments pertaining to the review criteria were used to help make inclusion decisions, and key words were chosen to assist in indexing the papers.

Papers were ranked automatically in two ways: (1) by the number of positive ratings (ratings above the neutral midpoint of the scale), by the number of negative ratings (below the midpoint), and by the number of nonnegative or nonpositive ratings; and (2) by the mean of the ratings. Each editor went through each set of ratings and comments and made independent recommendations for inclusion or exclusion. These were merged, and after a single round of adjustments, the number of papers accepted rose to 79.

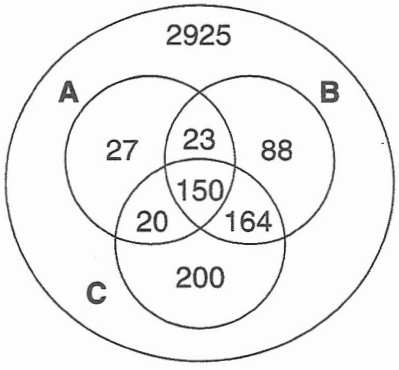


*Figure 1. Editors' determination of the HCI relevance of the 3,597 initially selected papers.*

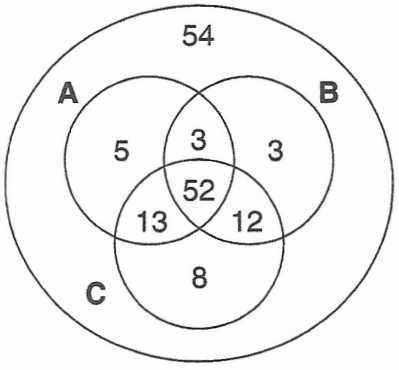


*Figure 2. Editors' initial recommendations for inclusion of the 150 reviewed papers.*

## Topics Represented

Table 1 shows that most of the included papers fell into the design and evaluation categories. Almost a quarter (18) of the papers were not classified as being relevant to any life cycle stage, but the results from many uncategorized papers should be applicable to analysis and design.

**Table 1. Papers Addressing Process Life Cycle Stages**

| *Stage* | *No. Papers* | *Percentage* |
|---|---|---|
| Analysis | 12 | 15 |
| Design | 40 | 51 |
| Prototyping | 12 | 15 |
| Implementation | 5 | 6 |
| Evaluation | 34 | 43 |
| None of the above | 18 | 23 |

Most of the papers (62, or 78%) used an empirical methodology of some kind. This large percentage reflects both the nature of HCI work presented at HFES annual meetings and the bias of the editors. Of the initial 150 papers selected for review, 102 (68%) were judged by the reviewers to use empirical methods. In contrast, about a third of the papers used models/theories and about a third used a developmental method (e.g., a demonstration system).

**Table 2. Papers by Methodology Used**

| *Methodology* | *No. Papers* | *Percentage* |
|---|---|---|
| Empirical | 62 | 78 |
| Models/Theories | 25 | 32 |
| Development | 24 | 30 |
| Case Studies | 13 | 16 |
| Survey | 7 | 9 |
| Other | 8 | 10 |

The Topic Table following this preface summarizes these categories for each paper included in the collection.

## Acknowledgments

Many people helped make the collection possible. At the HFES central office, Publications Manager Lois Smith and Executive Director Lynn Strother contributed to the proposal and production. We thank the Publications Subcouncil and Executive Council for their support. At Ohio State, Dave Woods and Phil Smith served as backup reviewers. We owe the most thanks to the following reviewers for their help throughout the evaluation process: Edie M. Adams (Microsoft Corporation), Arlene F. Aucella

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# Topic Table

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| 10 | ● | | | | | ● | • | | • | | Self-Logging Method for Studying System Activities |
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*Note:* ● *designates strong relevance*

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