

COMPUTER SUPPORTED COOPERATIVE WORK

Duska Rosenberg
and Chris Hutchison (Eds.)

Design Issues in CSCW

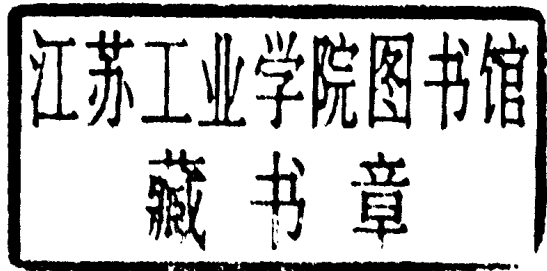
CSCW 的设计问题

Springer-Verlag

世界图书出版公司

Duska Rosenberg and
Chris Hutchison (Eds.)

Design Issues in CSCW



Springer-Verlag

世界图书出版公司

北京·广州·上海·西安

书 名: Design Issues in CSCW
作 者: D.Rosenberg, C.Hutchison (eds.)
中 译 名: CSCW 中的设计问题
出 版 者: 世界图书出版公司北京公司
印 刷 者: 北京中西印刷厂
发 行: 世界图书出版公司北京公司 (北京朝阳门内大街 137 号 100010)
开 本: 大 32 开 850 × 1168 印 张: 10.75
版 次: 1998 年 8 月第 1 版 1998 年 8 月第 1 次印刷
书 号: 7-5062-3925-6/TP•31
版权登记: 图字 01-98-1121
定 价: 49.00 元

世界图书出版公司北京公司已获得 Springer-Verlag 授权在中国
境内独家重印发行。

COMPUTER SUPPORTED COOPERATIVE WORK

Also in this series

CSCW in Practice: An Introduction and Case Studies

(ISBN 3-540-19784-2)

Dan Diaper and Colston Sanger (Eds.)

Computer Supported Collaborative Writing

(ISBN 3-540-19782-6)

Mike Sharples (Ed.)

CSCW: Cooperation or Conflict?

(ISBN 3-540-19755-9)

Steve Easterbrook (Ed.)

CSCW and Artificial Intelligence

(ISBN 3-540-19816-4)

John H. Connolly and Ernest A. Edmonds (Eds.)

Duska Rosenberg, BA, MA, DipCAI, PhD
Department of Computer Science
Brunel University
Uxbridge
Middlesex UB8 3PH, UK

Christopher Hutchison, MSc, PhD
Faculty of Technology
Kingston University
Penrhyn Road
Kingston upon Thames
Surrey KT1 2EE, UK

Series Editors

Dan Diaper, PhD
Department of Computer Science
University of Liverpool
PO Box 147, Liverpool L69 3BX, UK

Colston Sanger
GID Ltd
69 King's Road
Haslemere, Surrey GU27 2QG, UK

ISBN 3-540-19810-5 Springer-Verlag Berlin Heidelberg New York
ISBN 0-387-19810-5 Springer-Verlag New York Berlin Heidelberg

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data
A catalog record for this book is available from the Library of Congress

© Springer-Verlag London Limited 1994
Printed in Great Britain

The use of registered names, trademarks etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant laws and regulations and therefore free for general use.

The publisher makes no representation, express or implied, with regard to the accuracy of the information contained in this book and cannot accept any legal responsibility or liability for any errors or omissions that may be made.

This reprint has been authorized by Springer-Verlag (Berlin/Heidelberg/New York) for sale in the People's Republic of China only and not for export therefrom.
Reprinted in China by Beijing World Publishing Corporation, 1998

Preface

One of the most significant developments in computing over the last ten years has been the growth of interest in computer based support for people working together. Recognition that much work done in offices is essentially group work has led to the emergence of a distinct subfield of computer science under the title Computer Supported Cooperative Work (CSCW). Since the term was first coined in 1984, there has been growing awareness of the relevance to the field of, and the valuable contributions to be made by, non-computing disciplines such as sociology, management science, social psychology and anthropology. This volume addresses design issues in CSCW, and – since this topic crucially involves human as well as technical considerations – brings together researchers from such a broad range of disciplines.

Most of the chapters in this volume were originally presented as papers at the one-day seminar, "Design Issues in CSCW", held at the Department of Trade and Industry (DTI), London, on 17 March 1992, one in a series of DTI-supported CSCW SIG seminars.

We would like to express our gratitude to the series editors, Colston Sanger and Dan Diaper, for their useful comments on, and suggestions for revisions to, the final draft of the manuscript; to Linda Schofield, our editor at Springer, for her continued encouragement throughout the preparation of the manuscript; and, finally, to our respective families for their support and patience over so many months.

London
June 1993

Duska Rosenberg
Chris Hutchison

Contributors

Peter Barnwell

School of Computer Science and Electronic Systems, Kingston University, Kingston upon Thames, Surrey KT1 2EE, UK

Cornelia Boldyreff

School of Engineering and Computer Science, University of Durham, South Road, Durham DH1 3LE, UK

Sean M. Clark

Department of Computer Studies, University of Technology, Loughborough, Leicestershire LE11 3TU, UK

Keith Devlin

Saint Mary's College of California, PO Box 3517, Moraga, CA 94575-3517, USA

Alan Dix

School of Computing and Mathematics, University of Huddersfield, Queensgate, Huddersfield HD1 3DH, UK

Mike Hales

Centre for Business Research, University of Brighton, Falmer, Brighton BN1 9PH, UK

Mark J. Handley

Department of Computer Science, University College London, Gower Street, London WC1E 6BT, UK

Betty Hewitt

Cognitive Systems Group, Risoe National Laboratory, PO BOX 49, DK 4000, Roskilde, Denmark

Philip T. Hughes

BNR Europe Ltd, London Road, Harlow, Essex CM17 9NA, UK

Chris Hutchison

School of Information Systems, Kingston University, Kingston upon Thames, Surrey KT1 2EE, UK

Nermeen M. Ismail

Department of Computer Science, University College London, Gower Street, London WC1E 6BT, UK

David Jenkins

Department of Computing and Information Systems, University of Paisley, High Street, Paisley PA1 2BE, UK

Nicola Keen

Department of Computer Studies, University of Technology, Loughborough, Leicestershire LE11 3TU, UK

Mark Klein

Boeing Computer Services, PO Box 24346, Seattle, WA 98124-0346, USA

Ron Malyan

School of Computer Science and Electronic Systems, Kingston University, Kingston upon Thames, Surrey KT1 2EE, UK

Oliver Masting

Department of Computer Science, University of Edinburgh, King's Buildings, Mayfield Road, Edinburgh EH9 3JZ, UK

Andy McKinlay

Department of Maths and Computer Science, University of Dundee, Dundee DD1 4HN, UK

Michele E. Morris

BNR Europe Ltd, London Road, Harlow, Essex CM17 9NA, UK

Diane Murray

Department of Sociology, University of Surrey, Guildford GU2 5XH, UK

Tony A. Plant

BNR Europe Ltd, London Road, Harlow, Essex CM17 9NA, UK

Rob Procter

Department of Computer Science, University of Edinburgh, King's Buildings, Mayfield Road, Edinburgh EH9 3JZ, UK

Duska Rosenberg

Department of Computer Science, Brunel University, Uxbridge,
Middlesex UB8 3PH, UK

Martina Angela Sasse

Department of Computer Science, University College London,
Gower Street, London WC1E 6BT, UK

Stephen A.R. Scrivener

Design Research Centre, University of Derby, Kedleston Road,
Derby DE22 1GB, UK

Maria Winnett

School of Computer Science and Electronic Systems, Kingston
University, Kingston upon Thames, Surrey KT1 2EE, UK

Robin Woodburn

Department of Electrical Engineering, University of Edinburgh,
King's Buildings, Mayfield Road, Edinburgh EH9 3JZ, UK

Contents

List of Contributors	xv
1 Introduction	
<i>D. Rosenberg and C. Hutchison</i>	1
2 Computer Supported Cooperative Work: A Framework	
<i>A. Dix</i>	9
3 Capturing Interactions: Requirements for CSCW	
<i>D. Murray and B. Hewitt</i>	27
4 Situation Theory and the Design of Interactive Information Systems	
<i>K. Devlin</i>	61
5 Patterns of Language in Organizations: Implications for CSCW	
<i>C. Hutchison</i>	89
6 Coordination Issues in Tools for CSCW	
<i>R. Procter, A. McKinlay, R. Woodburn and O. Masting</i>	119
7 Software Engineering Design: A Paradigm Case of Computer Supported Cooperative Working	
<i>C. Boldyreff</i>	139
8 Where Are Designers? Styles of Design Practice, Objects of Design and Views of Users in CSCW	
<i>M. Hales</i>	151
9 Coping with Complexity and Interference: Design Issues in Multimedia Conferencing Systems	
<i>M.A. Sasse, M.J. Handley and N.M. Ismail</i>	179

10 The Role of Replication in the Development of Remote CSCW Systems	
<i>S. Scrivener, S. Clark and N. Keen</i>	197
11 Computer Supported Conflict Management in Design Teams	
<i>M. Klein</i>	209
12 ShareLib: A Toolkit for CSCW Applications Programming Using X Windows	
<i>M. Winnett, R. Malyan and P. Barnwell</i>	229
13 Adapting a Design History Editor for Concurrent Engineering	
<i>D. Jenkins</i>	241
14 "Nouvelle Design": A Pragmatic Approach to CSCW Systems Building	
<i>P.T. Hughes, M.E. Morris and T.A. Plant</i>	271
References	293
Subject Index	309
Name Index	315

List of Contributors.....	xv
 1 Introduction	
<i>D. Rosenberg and C. Hutchison.....</i>	1
 2 Computer Supported Cooperative Work: A Framework	
<i>A. Dix</i>	9
2.1 Introduction	9
2.2 Cooperative Work	10
2.2.1 Cooperation	10
2.2.2 Work	11
2.2.3 Communication through the Artefact	13
2.2.4 Understanding: Soft and Hard Artefacts.....	14
2.2.5 Deixis	15
2.3 Computer Support: Communication.....	16
2.3.1 Computer Mediated Communication	16
2.3.2 Anti-CMC	18
2.4 Computerized Artefacts of Work	19
2.5 Non-Computerized Artefacts	21
2.5.1 Prosthesis	21
2.5.2 Implications for Design	22
2.5.3 Success Story: Bar Codes	25
2.6 Summary	25
 3 Capturing Interactions: Requirements for CSCW	
<i>D. Murray and B. Hewitt.....</i>	27
3.1 Design Issues for CSCW	27
3.1.1 The Life-Cycle Framework	30
3.2 Ethnographic Study of Office Work	31
3.3 Case Study of a Technical Publications Unit.....	33
3.3.1 Organizational Description	35
3.3.2 Authors' Views on their Work.....	36
3.3.3 Life History of a Job.....	37
3.3.4 Job Conditions	39
3.3.5 Interaction Episodes	43

3.4 The Analysis.....	46
3.4.1 Strategy	46
3.4.2 Classification of Activities	46
3.5 Conclusions.....	55
3.5.1 What the Authors Want.....	55
3.5.2 What the Analysis Found	56
3.5.3 In Conclusion.....	58
 4 Situation Theory and the Design of Interactive Information Systems	
<i>K. Devlin</i>	61
4.1 Introduction	61
4.2 Information	62
4.3 On Mathematics, Metaphor and Design	65
4.4 Situation Theory: A Review	69
4.5 Normative Constraints and Cognition.....	75
4.6 Information, Situations and Design	79
4.7 Multimedia and Multi-User.....	81
4.8 The Role of Situation Theory	83
4.9 Conclusion	86
 5 Patterns of Language in Organizations: Implications for CSCW	
<i>C. Hutchison</i>	89
5.1 Introduction	89
5.1.1 Aims.....	89
5.1.2 The Sopwith Case Study.....	91
5.2 Four Models of Linguistic Support for Collaborative Work	93
5.2.1 Language and Information	93
5.2.2 Sociometric Analysis.....	95
5.2.3 Style Checkers: Form versus Content.....	102
5.2.4 Language and Reality: An Overview of Systemic Functional Linguistics	105
5.2.5 Language, Information and Organizations	109
5.3 Conclusions.....	114
Appendix A	114
A.1 The Message from Leyland.....	114
A.2 How the <i>Sunday Times</i> Rewrote It	115
Appendix B.....	116
B.1 Alcatraz on the Third Floor or Communications and Information Free of Time and Space (CIFTS!).....	116

6 Coordination Issues in Tools for CSCW

<i>R. Procter, A. McKinlay, R. Woodburn and O. Masting</i>	119
6.1 Introduction	119
6.2 Early Experiences with CSCW	120
6.3 Cognitive Issues in CSCW	121
6.4 Conversation Analysis	122
6.4.1 Turn Management in Conversations	123
6.4.2 An Example of Conversation Analysis	124
6.5 Coordination in CSCW	128
6.6 Studies of Turn Management in CSCW	131
6.7 Discussion	133
6.8 Concluding Remarks	135
Appendix A	136
A.1 Annotated Bibliography	136

7 Software Engineering Design: A Paradigm Case of Computer Supported Cooperative Working

<i>C. Boldyreff</i>	139
7.1 Introduction	139
7.1.1 What is Design Theory?	140
7.1.2 Is Design a Natural Phenomenon?	141
7.1.3 A View of Design from Cognitive Science	142
7.2 Use of Abstract Representations	143
7.2.1 Implications for Design Methods and Tool Support	143
7.2.2 Philosophical Issues: Are they relevant?	144
7.2.3 The Role of Concepts in Structuring Knowledge	145
7.3 The Design Frameworks Approach	145
7.4 An Approach to Design-for-Reuse	146
7.4.1 Considerations Regarding the Use of Frameworks in Design	147
7.5 Conclusions	150

8 Where Are Designers? Styles of Design Practice, Objects of Design and Views of Users in CSCW

<i>M. Hales</i>	151
8.1 Design as Technique, as Social Function and as Politics	153
8.2 Three Interpretations of the Significance of "Users"	155
8.3 Users as Clients: The "Specify and Deliver" Style	156
8.4 Users as Codesigners: The "Reflect and Reinterpret" Style	158
8.5 Users as Actor-Constructors: The "Enable and Empower" Style	161
8.6 Where are Designers? The Geo-Economic "Location" Problem	165
8.7 Taking Design with Us	170

9 Coping with Complexity and Interference: Design Issues in Multimedia Conferencing Systems

<i>M.A. Sasse, M.J. Handley and N.M. Ismail</i>	179
9.1 Introduction	179
9.2 The CAR Multimedia Conferencing System	180
9.3 Design Principles	182
9.3.1 WYSIWIS	183
9.3.2 Seamlessness	184
9.4 Design and Usability Issues	184
9.4.1 Screen Clutter	185
9.4.2 Unexpected Events	187
9.4.3 Notification of Events	187
9.4.4 Floor Control	189
9.4.5 Pointers	190
9.5 Discussion: Design Principles for Multimedia Conferencing	192
9.6 Conclusions	194

10 The Role of Replication in the Development of Remote CSCW Systems

<i>S. Scrivener, S. Clark and N. Keen</i>	197
10.1 Designing for the Future	197
10.1.1 The System Designer as Creative Problem Solver	197
10.1.2 The Difficulty of Exchanging Creation for Facilitation	198
10.1.3 Single-User Product Innovation	198
10.2 Designing for the Present: Replication	199
10.3 An Experiment in Replication	200
10.3.1 The ROCOCO Station	201
10.3.2 User Interface	202
10.4 Evaluating the System	203
10.4.1 The LookingGlass	203
10.4.2 An Investigation of the LookingGlass in Use	205
10.5 Conclusion	207

11 Computer Supported Conflict Management in Design Teams

<i>M. Klein</i>	209
11.1 The Challenge: Supporting Collaboration in Design Groups	209
11.2 Contributions and Limitations of Existing Work	210
11.3 The Design Collaboration Support System	212
11.3.1 Describing Design Actions and Rationale	213
11.3.2 Detecting Conflicts	219
11.3.3 Resolving Conflicts	223
11.4 Evaluation and Future Work	225

12 ShareLib: A Toolkit for CSCW Applications

Programming Using X Windows

<i>M. Winnett, R. Malyan and P. Barnwell</i>	229
12.1 Introduction.....	229
12.2 Existing Applications.....	230
12.3 Other Similar Work.....	230
12.4 What Programming Support Should Provide.....	231
12.4.1 Features of CSCW	231
12.4.2 Tailorability	232
12.5 Design of ShareLib: Architecture	232
12.5.1 A New Level of Abstraction.....	232
12.5.2 Features and Tailorability Provided by the CSCW Layer	234
12.6 Design of ShareLib: Implementation.....	235
12.6.1 The X Window System.....	235
12.6.2 ShareLib as a Layer above X Windows	236
12.7 Example Implementation: The Telepointer	237
12.7.1 Writing Xlib Applications.....	237
12.7.2 The Telepointer Type	237
12.7.3 Initializing the Telepointer	238
12.7.4 Processing Telepointer Events	239
12.7.5 Floor Control	239
12.7.6 Drawing the Telepointer Pixmap.....	239
12.8 Summary and Further Work	239

13 Adapting a Design History Editor for Concurrent Engineering

<i>D. Jenkins</i>	241
13.1 Introduction.....	241
13.1.1 Motivation	241
13.1.2 Starting Point	242
13.1.3 Outline of the DHE Work	243
13.2 Design History Editor	247
13.2.1 Inherent Difficulties with Current Approaches...	247
13.2.2 Conventional Logbooks and Hypertext.....	248
13.2.3 The Impact of Prescription.....	249
13.3 User Requirements of the Design History Editor	250
13.3.1 Page Emulation	250
13.3.2 Representation of Finer Structure.....	251
13.3.3 The Lemma.....	256
13.4 Technology	262
13.4.1 The SMART Frame Server.....	263
13.4.2 The Blackboard Architecture.....	265
13.4.3 Managing Knowledge Assets.....	266
13.4.4 Khoros	267
13.5 Technology Transfer.....	267
13.6 Concluding Remarks.....	269