

CONTENTS

PREFACE BY RAMESH SHARDA.....	1
ACKNOWLEDGEMENTS.....	III
INTRODUCTION	1
THREE MAIN NEEDS OF MIS/DSS RESEARCH.....	3
<i>Clarification of Reference Disciplines.....</i>	3
<i>Defining Dependent Variables.....</i>	3
<i>Building a Cumulative DSS Research Tradition.....</i>	4
THE PRIMARY OBJECTIVE OF THIS BOOK.....	4
ORGANIZATION OF THE BOOK.....	5
CHAPTER 1 INTRODUCTION TO DECISION SUPPORT SYSTEMS.....	7
EVOLUTION OF DECISION SUPPORT SYSTEMS	8
<i>Definition of Decision Support Systems.....</i>	11
ARCHITECTURE OF DECISION SUPPORT SYSTEMS.....	11
<i>Decision-Making Processes and Functions.....</i>	12
DECISION SUPPORT SYSTEM SUB-SPECIALTIES.....	15
<i>Data/Model Management</i>	15
<i>User Interface Sub-Systems</i>	17
<i>Knowledge-Based Decision Support Systems.....</i>	18
<i>Group DSS/Group Support Systems/Electronic Meeting Systems.....</i>	18
<i>Organizational Decision Support Systems.....</i>	19
SUB-SPECIALTIES BASED ON ORGANIZATIONAL PERSPECTIVES.....	20
<i>Decision Support System Design</i>	20
<i>Decision Support System Implementation</i>	21
<i>Decision Support System Evaluation.....</i>	21
<i>Application Development Research.....</i>	22
THE FUTURE OF DECISION SUPPORT SYSTEMS	22
<i>Single User Decision Support Systems</i>	23
<i>Knowledge-Based Decision Support Systems (Intelligent DSS)</i>	24
<i>The World Wide Web and Group/Organizational/Global DSS</i>	25
CHAPTER 2 RESEARCH METHODOLOGY.....	27
WHAT IS BIBLIOMETRICS (STATISTICAL BIBLIOGRAPHY)?	27
<i>What Is Author Cocitation Analysis?.....</i>	28
<i>Assumptions of Author Cocitation Analysis.....</i>	29
<i>Purposes and Benefits of Author Cocitation Analysis.....</i>	30
AUTHOR COCITATION ANALYSIS STEP	31
<i>Selection of Author.....</i>	31
<i>Retrieval/Generation of Cited Author Counts (Cocitation Frequencies)</i>	34

<i>Input Data (Cocitation Matrix) Preparation</i>	35
<i>Multivariate Analysis Of Correlation Matrix</i>	46
SAS DATA FILE PREPARATION	48
<i>Factor Analysis</i>	48
<i>Cluster Analysis</i>	58
<i>Multidimensional Scaling (MDS)</i>	62
CHAPTER 3 DATA.....	73
SELECTION CRITERIA FOR CREATING THE CITING ARTICLE DATABASE.....	74
<i>Cited Articles</i>	78
CHAPTER 4 THE INTELLECTUAL STRUCTURE OF DECISION SUPPORT SYSTEMS RESEARCH (1969-1990).....	81
INTRODUCTION	82
DATA	84
RESEARCH METHODOLOGY	85
<i>Selection Of Author</i>	85
<i>Compilation Of Cocitation Frequency Matrix</i>	86
<i>Data Analysis</i>	87
RESULTS OF FACTOR ANALYSIS	88
<i>Reference (Contributing) Disciplines</i>	92
<i>DSS Research Subspecialties</i>	93
RESULTS OF CLUSTER ANALYSIS AND MULTIDIMENSIONAL SCALING.....	101
MAJOR CONTRIBUTIONS OF ORGANIZATIONAL SCIENCE TO THE DEVELOPMENT OF DSS RESEARCH SUBSPECIALTIES	107
<i>Contributions Of Organizational Science To The Foundations Of Decision Support Systems</i>	108
<i>Contributions Of Organizational Science To The User Interface/Individual Differences</i>	110
<i>Contributions Of Organizational Science To Model Management</i>	111
CONCLUSIONS	111
CHAPTER 5 THE INTELLECTUAL STRUCTURE OF DECISION SUPPORT SYSTEMS RESEARCH (1991-2004).....	115
INTRODUCTION	116
DATA	116
RESEARCH METHODOLOGY	118
GROUP SUPPORT SYSTEMS AND ELECTRONIC MEETING SYSTEMS	125
GSS FOUNDATIONS	132
<i>The Progression to EMS</i>	136
EMPIRICAL/LABORATORY EXPERIMENTAL STUDIES	142
<i>Initial Explorations (1980-1984)</i>	142
<i>Early Experiments (1985-1991)</i>	142
<i>Field Studies</i>	145
<i>In-depth Studies</i>	145

QUANTITATIVE INTEGRATION OF GDSS/GSS/EMS EMPIRICAL RESEARCH	156
<i>Meta-analysis of EMS Experimental literature between 1980-1990.....</i>	156
<i>Meta-Analysis of the literature between 1970 and 1992</i>	159
QUALITATIVE INTEGRATION OF GDSS/GSS/EMS EMPIRICAL RESEARCH	162
<i>Qualitative Integration through Re-conceptualization by Kraemer and Pinsonneault</i>	163
<i>Pinsonneault and Kramer's Review of the literature up to 1988</i>	165
<i>Qualitative Integration by George et al.....</i>	169
<i>Qualitative Integration via Contingency Modeling</i>	173
<i>Theoretical Approaches to Integration.....</i>	180
OTHER MISCELLANEOUS RESEARCH.....	184
<i>System and Tool Developments</i>	184
<i>GSS/EMS Application Developments</i>	186
<i>Integrating GSS with Other Technologies</i>	187
MODEL MANAGEMENT	188
<i>Model Representation.....</i>	192
<i>Model Manipulation/Integration</i>	196
<i>Modeling Language/System Development</i>	197
FOUNDATIONS, DESIGN, AND IMPLEMENTATION	202
<i>Foundations</i>	202
<i>Design</i>	207
<i>Other Area: Identification of the Intellectual Structure of DSS</i>	211
DSS EVALUATION	211
USER-INTERFACE/IMPLEMENTATION	216
<i>Synthesis of Implementation Research by Zmud.....</i>	217
<i>A Review of Research on User-Involvement and MIS Success by Ives and Olson.....</i>	218
<i>A Field Study of Sanders and Courtney.....</i>	221
<i>Quantitative Review of the Empirical DSS Implementation Literature.....</i>	221
<i>Implementation Research Focusing on User Related factors.....</i>	224
<i>Implementation Research Focusing on Other Factors and Issues</i>	226
<i>Implementation Research using Actor-Network Theory.....</i>	227
<i>Findings of Implementation Research</i>	228
MCDSS/NSS.....	229
<i>Categorization of MCDSS.....</i>	229
<i>Negotiation Support Systems</i>	233
FACTOR 7 UNNAMED	237
<i>Cognitive Fit Theory</i>	238
FACTOR 8: UNNAMED	241
RESULTS OF CLUSTER ANALYSIS	244
RESULTS OF MULTI-DIMENSIONAL SCALING ANALYSIS	252
<i>Two-Dimensional MDS Maps</i>	252
<i>Three-Dimensional MDS Maps</i>	256
REFERENCE DISCIPLINES OF DECISION SUPPORT SYSTEMS	261
<i>Cognitive Psychology.....</i>	267

<i>Social Psychology</i>	273
<i>Computer-Supported Cooperative Work (CSCW)</i>	274
<i>Social Psychology</i>	275
<i>Management Science</i>	278
<i>MCDM</i>	280
<i>Organizational Communication</i>	282
<i>Organization Science</i>	285
<i>Applied Information Processing Psychology</i>	285
CONCLUSION	287
<i>Increasing Reliance on the Reference Disciplines</i>	288
<i>Many DSS Empirical Studies Developed Corroborating Theories that Belong to Other Disciplines</i>	288
<i>Cumulative Tradition and Development of Endogenous DSS Theories</i>	290
<i>Strengthen Relationships with Non-discourse Practices</i>	292

CHAPTER 6 RELATIONSHIPS BETWEEN THE DECISION SUPPORT SYSTEM SUBSPECIALTIES AND REFERENCE DISCIPLINES..... 293

INTRODUCTION	294
DATA	295
RESEARCH METHODOLOGY	296
EMPIRICAL INVESTIGATIONS OF THE RELATIONSHIP BETWEEN THE DSS SUBSPECIALTIES AND REFERENCE DISCIPLINES	297
<i>The Impact of Systems Science on User Interfaces and Implementation</i>	302
<i>The Impact of Systems Science on Foundations</i>	304
<i>The Impact of Organization Science on Foundations</i>	305
<i>The Impact of Organization Science on User Interfaces and Implementation</i>	306
<i>The Impact of Cognitive Science on User Interfaces and Implementation.</i> 306	306
<i>The Impact of Cognitive Science on Model Management</i>	308
<i>The Impact of Artificial Intelligence on Model Management</i>	309
<i>The Impact of Artificial Intelligence on Foundations</i>	310
<i>The Impact of Artificial Intelligence on MCDSS</i>	311
<i>The Impact of MCDM on Foundations</i>	312
<i>The Impact of MCDM on MCDSS</i>	313
<i>The Impact of MCDM on Model Management</i>	314
<i>The Impact of Group Decision Making and Other Reference Disciplines on GDSS</i>	315
CONCLUSION	316

CHAPTER 7 ASSESSING THE CURRENT STATE OF INTELLECTUAL RELATIONSHIPS BETWEEN THE DECISION SUPPORT SYSTEMS AREA AND OTHER ACADEMIC DISCIPLINES 319

INTRODUCTION	320
DATA AND RESEARCH METHODOLOGY	320
RESULTS	321

THE INTELLECTUAL RELATIONSHIP BETWEEN THE DSS SUBSPECIALTIES AND OTHER DISCIPLINES WITHIN THE BUSINESS SCHOOL	324
<i>An Overview of Contributions to DSS Areas from Organization Science..</i>	324
<i>An Overview of Contributions to Multiple Criteria DSS from MCDM.....</i>	325
<i>An Overview of Contributions to DSS Areas from Other Disciplines within the Business School.....</i>	326
THE INTELLECTUAL RELATIONSHIP BETWEEN THE DSS SUBSPECIALTIES AND OTHER DISCIPLINES OUTSIDE THE BUSINESS SCHOOL.	328
<i>An Overview of Contributions to DSS Areas from Systems Science.....</i>	328
<i>An Overview of Contributions to DSS Areas from Cognitive Science.....</i>	329
<i>An Overview of Contributions to Model Management from Artificial Intelligence.....</i>	331
<i>An Overview of Contributions to GDSS from Psychology.....</i>	333
<i>An Overview of Contributions to GDSS from Communication Theory.....</i>	335
<i>An Overview of Contributions to the DSS Areas from Other Disciplines ..</i>	336
CONCLUSION.....	336
CHAPTER 8 THE CONTRIBUTIONS OF MULTI CRITERIA DECISION MAKING TO THE DEVELOPMENT OF DECISION SUPPORT SYSTEMS SUBSPECIALTIES.....	339
INTRODUCTION	339
THE IMPACT OF MCDM ON FOUNDATIONS	340
THE IMPACT OF MCDM ON MCDSS.....	340
THE IMPACT OF MCDM ON MODEL MANAGEMENT.....	341
THE IMPACT OF MCDM ON GROUP DSS	342
CONCLUSION.....	344
CHAPTER 9 THE CONTRIBUTIONS OF SYSTEMS SCIENCE TO THE DEVELOPMENT OF THE DECISION SUPPORT SYSTEM SUBSPECIALTIES	347
INTRODUCTION	347
THE CONTRIBUTIONS OF SYSTEMS SCIENCE ON DSS FOUNDATIONS	348
THE CONTRIBUTIONS OF SYSTEMS SCIENCE ON IMPLEMENTATION	354
THE CONTRIBUTIONS OF SYSTEMS SCIENCE ON INDIVIDUAL DIFFERENCE/USER INTERFACE.....	356
THE CONTRIBUTIONS OF SYSTEMS SCIENCE ON MODEL MANAGEMENT.....	357
THE CONTRIBUTIONS OF SYSTEMS SCIENCE ON GSS.....	359
CONCLUSION.....	361
CHAPTER 10 THE CONTRIBUTIONS OF COGNITIVE SCIENCE TO THE DEVELOPMENT OF DECISION SUPPORT SYSTEM SUBSPECIALTIES	363
INTRODUCTION	363
REVIEW OF IMPORTANT COGNITIVE SCIENCE THEORIES/CONCEPTS	364
<i>Judgment and Inference.....</i>	367

<i>Choice</i>	368
CONTRIBUTIONS TO DSS DESIGN/USER INTERFACES FROM COGNITIVE SCIENCE	
.....	371
<i>From Cost-Benefit Theory to Cognitive Fit Theory</i>	371
<i>Fallible Judgment: A Basis of DSS Design Theory</i>	372
<i>Human Cognitive Limitations: A Basis of the ROMC Approach</i>	372
<i>Applied Psychology Research Aided the User Interface Design</i>	373
CONTRIBUTIONS TO IMPLEMENTATION FROM COGNITIVE SCIENCE	373
CONTRIBUTIONS TO MODEL MANAGEMENT FROM COGNITIVE SCIENCE	374
<i>Cognitive Science Aids In Problem Structuring</i>	374
<i>Development Of Graph-Based Modeling</i>	375
CONTRIBUTIONS TO INTELLIGENT DSS FROM COGNITIVE SCIENCE	375
<i>Development Of Neural Networks</i>	375
<i>Intelligent Agent Research</i>	377
CONTRIBUTIONS TO GSS FROM COGNITIVE PSYCHOLOGY	377
<i>Group Idea Generation And Cognitive Science</i>	377
CONTRIBUTIONS TO MCDSS FROM COGNITIVE PSYCHOLOGY	379
CONCLUSION	380
CHAPTER 11 A SURVEY OF DECISION SUPPORT SYSTEM APPLICATIONS (1971 - 2001)	381
INTRODUCTION	381
SELECTION CRITERIA	382
ANALYSIS (1971-1994)	382
<i>Classification By Application Areas</i>	382
<i>Distribution of Underlying Models in DSSs</i>	388
<i>Some Other Notable Trends in Application Development</i>	389
ANALYSIS (1995-2001)	391
CONCLUSION AND IMPLICATIONS	404
<i>Negotiation Support Systems (NSS)</i>	405
<i>Knowledge-based decision support systems</i>	406
<i>Web-based decision support system</i>	408
<i>Organizational (multi-functional) DSS</i>	408
<i>Inter-Organizational Decision Support Systems (IODSS)</i>	409
CHAPTER 12 THE THEORY-PRACTICE DIVIDE IN DECISION SUPPORT SYSTEMS RESEARCH	413
ABSTRACT	413
INTRODUCTION	414
THE RESEARCH MODEL	415
RESEARCH METHOD AND DATA	417
FINDINGS	418
<i>Structural Differences between Theory and Practice – a Big Picture</i>	418
WHAT IS BEING USED IN IMPLEMENTED SYSTEM BUILDING?	421
INTERACTIONS BETWEEN THEORY AND PRACTICE	423

<i>The Impact of Theory on Practice</i>	423
<i>The Impact of Practice on Theory Development</i>	424
CONCLUSIONS	424
CHAPTER 13 CONCLUSIONS.....	427
WHAT HAS THE DSS COMMUNITY ACHIEVED OVER THE PAST THREE DECADES?	
.....	428
<i>Who Are The Members Of A Scientific Community?</i>	428
<i>What Do Its Members Share?</i>	429
<i>What Are the Reference Disciplines for Decision Support Systems?</i>	430
<i>What Are the Dependent Variables for Decision Support Systems?</i>	431
WHERE SHOULD THE DSS COMMUNITY GO FROM HERE?	434
<i>Empirical Studies in Trouble?</i>	435
<i>Altering the Prevailing Paradigm?</i>	436
<i>The Design Science Paradigm</i>	438
REFERENCES	439
SUBJECT INDEX.....	483
NAME INDEX.....	492

Illustrations

Figures

Figure 1.1 Components of the DSS	14
Figure 1.2 Theory, Applications, and Contributing Disciplines of Decision Support Systems.....	16
Figure 2.1 Author Cocitation Analysis Steps	32
Figure 2.2 Selecting from the Most Common Multivariate Techniques	47
Figure 2.3 Scree Plot of Eigenvalues	57
Figure 3.1 Citation Pattern.....	79
Figure 3.2 Changes in Citing Articles per Year.....	80
Figure 4.1 Major Factor Correlation Network.....	91
Figure 4.2 Dendrogram Depicting Cluster Structure and Joining Sequences (1970-1990)	102
Figure 4.3 Three-Dimensional MDS Map (1970-1990).....	103
Figure 4.4 Two-Dimensional MDS Map	106
Figure 5.1 Contingency Perspective for GDSS Research.....	133
Figure 5.2 Taxonomy of GDSS Settings	133
Figure 5.3 The Progression to EMS.....	135
Figure 5.4 GSS Research Model by Dennis et al. (1988).....	138
Figure 5.5 Potential EMS Effects	139
Figure 5.6 Model of Specific GDSS Effects on Influence Behavior.....	144
Figure 5.7 The Model for the Management of Cognitive Conflict in Groups....	153
Figure 5.8 Research Model of Chidarambaram (1996)	155
Figure 5.9 Variables in the Benbasat and Lim Meta-Analysis	161
Figure 5.10 A Framework for Analyzing the Impact of GDSS and GCSS on Group Processes and Outcomes.....	164
Figure 5.11 Modified Reder and Conklin Model.....	170
Figure 5.12 Communication Theory.....	174
Figure 5.13 Linking Communication Theory to Computer Support of Groups .	174
Figure 5.14 Contingency Model based on Communication Theory.....	175
Figure 5.15 Minority Influence Theory	176
Figure 5.16 Linking Minority Influence Theory to Computer Support of Groups	176
Figure 5.17 Contingency Model based on Minority Influence Theory	177
Figure 5.18 Human Information Processing Theory	178
Figure 5.19 Linking Human Information Processing Theory to Computer Support of Groups	178
Figure 5.20 Contingency Model based on Human Information Processing Theory	179
Figure 5.21 Major Constructs and Propositions of AST.....	181
Figure 5.22 Tools used by GroupSystems	185
Figure 5.23 Components of a DSS	204

Figure 5.24 Structure of a DSS (Expanded)	204
Figure 5.25 Data-Oriented DSS versus Model-Oriented DSS.....	206
Figure 5.26 Organizational Decision Making View of Walls et al. (1992).....	209
Figure 5.27 Design Theory for VIS	210
Figure 5.28 A Descriptive Model of User Involvement	219
Figure 5.29 User Factors/DSS Implementation Research Framework	223
Figure 5.30 Co-op Design Combining Individual and Group DSS	232
Figure 5.31 Structure of NSS (Mediator)	235
Figure 5.32 Mediator Design – Communication through Data Sharing	236
Figure 5.33 Extended Cognitive Fit Model.	240
Figure 5.34 Dendrogram Depicting Cluster Structure and Joining Sequence (1991-2004).....	250
Figure 5.35 Dendrogram Depicting the Structure and Joining Sequence of Cluster 7 (1991-2004).....	251
Figure 5.36 Two Dimensional MDS Map (GSS vs Model Management)	254
Figure 5.37 Two Dimensional MDS Map (GSS vs. Foundation)	255
Figure 5.38 Three Dimensional MDS Map	260
Figure 5.39 Hierarchy of Media Richness	284
Figure 6.1 Dendrogram Depicting DSS Research Areas and Contributing Disciplines with Authors.....	299
Figure 6.2 Dendrogram with Cluster Names (1970-1993)	300
Figure 6.3 Major Factor Intercorrelation Networks (1970-1993).....	301
Figure 7.1 Dendrogram Illustrating Hierarchical Clustering (1970-1995).....	322
Figure 7.2 Dendrogram Depicting Cluster Structure and Joining Sequences (1970- 1995)	323
Figure 10.1 A Global View of the Cognitive Architecture.....	365
Figure 12.1 Applications, Theory, and Contributing Disciplines of DSS	416
Figure 13.1 Information Systems Success Model.....	433
Figure 13.2 Respecified Version of DeLone and McLean's (1992) Model	433

Tables

Table 1.1 Taxonomy of Knowledge	10
Table 2.1 Reference of Citing Papers	35
Table 2.2 Sample Cocitation Matrix.....	36
Table 2.3 Part of The Matrix Generation System Output.....	38
Table 2.4 Diagonal Cell Value Adjusted Cocitation Matrix (1970-1990).....	40
Table 2.5 Transposed Cocitation Matrix (1970-1990)	43
Table 2.6 PROC FACTOR SAS Data/Command File	50
Table 2.7 SAS Data File Stored in drive C.....	65
Table 2.8 PROC FACTOR SAS Statement with an infile statement	66
Table 2.9 PROC CLUSTER SAS Statements	66
Table 2.10 PROC MDS SAS Statements	67
Table 2.11 SAS PROC G3D SAS Statements and Data.....	68
Table 2.12 PROC G3D SAS statement with an infile statement.....	71
Table 3.1 A List of Journals Publishing Citing Articles.....	75
Table 3.2 Citation Behavior	76
Table 4.1 Rotated Factor Correlations Matrix (1969-1990)	89
Table 4.2 Interfactor Correlations (1970-1990).....	100
Table 5.1 List of 119 Authors in the DSS area as Markers of the Intellectual Spaces (1991-2004)	117
Table 5.2 Eigenvalues of the Correlation Matrix (1991-2004).....	118
Table 5.3 Factor Structure Correlations (1991-2004).....	121
Table 5.4 Representative Works of Authors in GSS/EMS	126
Table 5.5 Levels of GDSS, Corresponding Group Problems and GDSS features	134
Table 5.6 Important Sources of Group Process Gains and Losses	140
Table 5.7 ANOVA Results for 13 Dependent Variables.....	148
Table 5.8 Summary of Hypothesis Testing.....	151
Table 5.9 Results of a Meta-Analysis on GSS Effects	158
Table 5.10 Summary of Findings in The Study of Benbasat and Lim	160
Table 5.11 Summary of Statistics for GSS vs. No_GSS Differences.....	161
Table 5.12 Impact of GDSS on Group Processes	167
Table 5.13 Impacts of GDSS on Outcomes	167
Table 5.14 Impact of GCSS on Group Processes	168
Table 5.15 Impact of GCSS on Outcomes	168
Table 5.16 Comparative Results of Experimental GDSS Results	171
Table 5.17 Summary of Significant Findings by George et al.	172
Table 5.18 Issues in Model Management	190
Table 5.19 Comparison of Graphic Tools in Model Management	191
Table 5.20 Proposed Knowledge Representation Schemes.....	192
Table 5.21 Advantages and Disadvantages of Proposed Knowledge	

Representation Schemes	192
Table 5.22 A Summary of Laboratory Studies of DSS Effectiveness	214
Table 5.23 Summary of Results of Studies that Examine User Involvement and MIS Success.....	220
Table 5.24 Interfactor Correlations (1991-2004).....	243
Table 5.25 Comparison of the Results of Factor and Cluster analyses	246
Table 5.26 Cluster History	246
Table 5.27 Badness of Fit Criterion.....	257
Table 5.28 MDS Configuration	257
Table 5.29 List of 66 Authors In the DSS Reference Disciplines as Markers of the Intellectual Spaces (1990-2004).....	262
Table 5.30 Eigenvalues of the Correlations Matrix	263
Table 5.31 Factor Structure Correlations (1991-2004).....	264
Table 5.32 Decision Strategies	271
Table 6.1 Interfactor Correlations (1990-1999).....	303
Table 11.1 Distribution of Tools.....	399
Table 12.1 Rotated Factor Correlations of Authors in Implemented DSS (1970-2001)	422