

Contents

<i>Preface</i>	<i>page xi</i>
1 Introduction	1
1.1 Information and information systems	1
1.2 Problems and challenges in information systems	2
1.3 Approaches and methods for information systems development	5
1.4 MEASUR: a semiotic approach to information systems	7
1.5 About this book	8
Part one Semiotic framework and methods	11
2 Understanding semiotics	13
2.1 Signs and their functions	13
2.2 Semiosis and learning	15
2.3 Semiotics in computing	17
2.4 Semiotics in organisations and information systems	19
3 A semiotic framework for information systems	21
3.1 Philosophical stance	21
3.1.1 Objectivist paradigm	21
3.1.2 Subjectivist paradigm	24
3.1.3 Radical subjectivist paradigm	26
3.2 The semiotic framework	26
3.2.1 Physics	27
3.2.2 Empirics	28
3.2.3 Syntactics	29
3.2.4 Semantics	30
3.2.5 Pragmatics	31
3.2.6 The social level	33
3.3 An example of semiotic analysis	35
4 A semiotic approach to information systems development	37

viii	<i>Contents</i>	
4.1	MEASUR	37
4.2	How MEASUR can help in information systems development	39
4.2.1	Infrastructure analysis	40
4.2.2	Systems analysis, design and implementation	46
4.3	Summary	47
5	Knowledge representation and information analysis	49
5.1	Some basic considerations in knowledge representation	50
5.1.1	Expressive adequacy and notional efficiency	50
5.1.2	Semantic primitives	50
5.1.3	Types of knowledge	51
5.2	Representation approaches	52
5.2.1	Typical examples	52
5.2.2	Conceptual graphs	54
5.3	Some fundamental issues of information analysis	56
5.4	The role of information analysis	58
6	Semantic Analysis	61
6.1	Theoretical aspects of Semantic Analysis	61
6.1.1	Affordances	61
6.1.2	Ontology and some other fundamental notions	63
6.2	NORMA	64
6.2.1	Well-formed formula	65
6.2.2	Affordance and ontological dependency	65
6.2.3	Semiotic behaviour	67
6.2.4	Time	67
6.2.5	Determiner and identity	68
6.2.6	Generic-specific relationship	68
6.2.7	Defining authority and responsibility	69
6.2.8	Graphic representation – ontology chart	69
6.3	Using LEGOL to specify Norms	71
6.4	Conducting a Semantic Analysis	73
6.4.1	Understand the problem domain	74
6.4.2	Generating candidate affordances	75
6.4.3	Candidate grouping	76
6.4.4	Ontology charting	78
6.4.5	Norm Analysis	79
6.5	Commentary on Semantic Analysis	80
7	Pragmatics and communication	82
7.1	Human communication	82

<i>Contents</i>	<i>ix</i>
7.2 Other approaches to communication	83
7.2.1 Speech Act Theory	83
7.2.2 Functional approach	86
7.2.3 Deontic logic for communication	89
7.3 Pragmatic aspect of human communication	94
7.4 The Norm Analysis method	98
7.4.1 The concept of norms	98
7.4.2 Norms in business organisations	100
7.4.3 Norm Analysis	102
7.4.4 Norms in computer systems	106
8 The social layer: modelling organisations as information systems	108
8.1 Organisations as information systems	109
8.2 The notion of responsibility	111
8.3 An organisational morphology	112
8.4 Modelling the organisation	113
8.5 Summary: requirements for an effective information modelling method	114
Part two Applications	117
9 From semiotic analysis to systems design	119
9.1 The semantic aspect of databases	119
9.2 Capturing the semantic aspect	120
9.3 Capturing the time aspect	121
9.4 Ontological modelling for conceptualisation	123
9.5 Intentions, propositional attitudes and consequent operations	124
9.6 Other aspects of databases: facts, beliefs, and knowledge	125
10 Semantic temporal databases	133
10.1 Databases	133
10.1.1 Developments in database management systems	133
10.1.2 Semantic temporal databases	136
10.2 The semantic templates	138
10.2.1 Defining a semantic template	138
10.2.2 ST for database design	139
10.3 Systems construction	142
10.4 LEGOL	143
10.4.1 Basic syntactic structure	143
10.4.2 Some important operations	145

x	<i>Contents</i>	
11	Normbase: a new approach to information management	150
11.1	The Normbase concept	150
11.2	The Normbase system	152
11.2.1	The Normbase engine	152
11.2.2	The semantic temporal database	154
11.2.3	The norm store	155
11.3	Information management with the Normbase system	156
11.4	Using semiotic methods with other approaches	157
11.4.1	Relational database for implementation	158
11.4.2	Object-oriented methods for design and implementation	159
12	Case study: development of a land resources information system	164
12.1	Background	164
12.2	Semantic Analysis for requirements modelling	165
12.3	Norm Analysis	171
12.4	System design and implementation in the Normbase approach	174
12.5	Discussions and conclusions	179
13	Case study: development of a test construction system	180
13.1	Background	180
13.1.1	CONTEST project	180
13.1.2	User requirements	181
13.1.3	Why choose Semantic Analysis?	184
13.2	System analysis	186
13.3	System design	190
13.4	System construction	194
13.5	Discussion and conclusions	194
	Appendix A Semantic templates and surrogate specification	196
A.1	Definition of ST	196
A.2	Examples of using ST in discourse modelling	197
A.3	Examples of surrogates	199
	Appendix B LEGOL applications in the CRIS case	201
B.1	Questions and LEGOL statements	201
B.2	Output from the Normbase	203
	<i>Bibliography</i>	208
	<i>Index</i>	217