

CONTENTS

Preface	V
Acknowledgements	V
Introduction	VII
CHAPTER 1	
Information Science in Context	1
1.1 The emergence of information science	1
1.2 The scope of information science	11
CHAPTER 2	
The Cognitive View and Information	15
2.1 The cognitive viewpoint versus cognitivism	19
2.2 Understanding information in information science	26
2.3 Information science seen as a cognitive science	37
2.4 Hermeneutics in IR interaction	41
2.5 Summary statements	47
CHAPTER 3	
Information Retrieval	49
3.1 Essential issues in IR	49
3.2 Major IR research approaches – an overview	57
CHAPTER 4	
The Traditional IR Research Approach	61
4.1 Classification theories	63
4.2 Indexing theory, controlled vocabulary issues	64
4.3 Natural language representation	67
4.4 IR technique developments	72
4.5 Relevance measurement techniques	78
4.6 Summary statements	80
CHAPTER 5	
The User-oriented IR Research Approach	83
5.1 The role of the intermediary and the user in IR	87
5.2 Major empirical user studies	91
5.3 Empirical investigations of user-intermediary-system interaction	99
5.4 Pre-search interviewing investigations, excluding retrieval	105
5.5 User-oriented analytic studies of IR interaction	112
5.6 Summary of analytic and empirical user-oriented studies	121
CHAPTER 6	
IR Interaction – the Cognitive Turn	123
6.1 Personal cognitive structures relevant to IR	124
6.2 Cognitive models for IR interaction	124
6.3 Design and evaluation methodologies in IR interaction	146
6.4 Summary statements	156
CHAPTER 7	
The Cognitive IR Research Approach	157
7.1 Selected intermediary designs in IR	160
7.2 'Intelligent' user model building vs supportive mechanisms in IR	175
7.3 The supportive user model building approach	181
7.4 Knowledge-based adaptive IR interaction	186
7.5 Towards a contextual IR theory?	194
7.6 Summary	201

CHAPTER 8	
The Mediator Model	203
8.1 The framework of the Mediator Model	204
8.2 The use of the framework	220
CHAPTER 9	
Conclusions	223
Definitions	227
References	231
Subject Index	241

- Aboutness, 50–53
and isness, 53
and meaning, 52, 192, 196–197
and relevance, 54
and representation, 50–53, 196–198
- Accessibility, 9
and use, 13–14
- Actual state of knowledge, 32, 42, 178, 181–183, 210–212
- Adaptive IR, 180–183, 186–190, 205, 220–222
- Analytic user studies, 112–120
- Analytics (indexing), 200
- Anomalous State of Knowledge, see ASK
- ASK assumption, 28–29, 106, 111–116, 217
critique, 29–30
- Associative chains, 200
- Author aboutness, 50, 67, 70
- Automatic indexing, 66, 68–77
- Behavioural IR, 92, 148–156
- Bibliometrics, 2, 12
- Black-board architecture, 161–164
- Bookhouse system, 164–167, 188–189
- Boolean logic, 72–73, 74
automatic generation, 167, 171
- Breakdown
hermeneutics, 44–46
IR interaction, 45–47, 129, 183
- Brookes' Equation, 31–32
- Browsing, 118–119, 164
- Cansearch system, 167–168
- Car-Driving Case – hermeneutics, 44–45, 183
- Casual user, 142–144, 183
- Citation clusters, 68
- Citation pearl strategy, 146, 161
- Classification theories, 63–64
- Classification vs indexing, 51
- Closed questions, 101–102
- Clustering techniques, 68, 75–77
nearest neighbour, 76
- CODER system, 90, 164
- Cognitive adaption, 188–190, 205, 220–222, 225
- Cognitive IR research, 58, 157–202
characteristics, 157–160
contextual theory, 194–201
design factors, 186–190
intelligent vs supportive IR, 175–181
intermediary designs, 161–175
knowledge-based IR, 186–194
landscape, 175–178, 194–202
NLP, 190–201
supportive user model building, 181–186
user modelling vs supportive IR, 175–181
- Cognitive models, 124–135, 148
of communication, 33, 135
of IR interaction, 16, 134–144, 148
- Cognitive science, 37–39
- Cognitive stage (or level), 22, 24, 181, 225
- Cognitive structures, 16
collective, 18, 145–146
individual, 124–132
in IR, 131–146, 160–175
information space, 134–136
intermediaries, 136–140
users, 140–145
- Cognitive task modelling, 146–150, 152–155, 220–222
- Cognitive turn, 18, 123–124
- Cognitive viewpoint, 15–25
and language philosophy, 24–25
and materialism, 19
and social approach, 19, 39–40
characteristics, 17, 22–23

- Cognitive viewpoint (cont.)
 - IR interaction, 16–18, 36, 194–202, 224–225
 - vs cognitivism, 19–25,
 - vs hermeneutics, 41–45, 196, 224
- Cognitivism, 19–25, 180–181, 191–192
- Collective cognitive structures, 18, 145–146
- Communication, 5, 26–27
- Communication levels, 29
- Communication theory, 26–27
 - mathematical, 4, 26
- Complementarity, 24, 39–41, 225
 - methods, 92–99, 147–156
- Compromized need, 113–116
- Concept – definition, 30
- Concept interpretation, 194–200
- Conceptual knowledge, 36, 136–145, 209–210
 - intermediaries, 36, 136–139
 - user model attribute, 209–210
 - user model building, 178
 - users, 140–145
- Conceptual support, 101–102, 117–118, 214–215
 - Domain Model (Mediator), 207
 - Euromath system, 168–171
 - European vs US online hosts, 190
 - Feedback Generator (Mediator), 214–215
 - frequency analysis, 181–186
 - influence in IR, 100–102,
 - need definition, 117–118
 - situational context, 129
- Conscious need, 113–115
- Conscious topical need, 117–118
- Contextual stage/level, 22–24, 194
- Contextualisation, 118, 129–130, 181–186, 194–202, 216
- Controlled vocabulary, 64–67
- Credibility, 187–188
- Dark Matter problem, 54–55, 152, 197
- Data, 32
- Danish Export to India Case, 65–66
- De Mey's Stages (or Levels), 22–23, 196, 225
- Deep knowledge, 43, 45, 143, 183
- Delta problem, 88–90, 115–116
- Design & evaluation
 - IR interaction, 146–156
 - intermediary systems, 220–222
- Design transfer, 149, 153–154, 222
- Design variables, 148, 221
- Designations, 30, 32
- Desired information, 11–13, 26
 - reasons, 12, 28, 46
- Detached contemplation, 44
- Dialogue Mode function, 109, 219–220
- Document-oriented indexing, 52
- Documentation, 2, 4–5
- Domain model, 90–91, 111, 138–140, 161–162, 204, 206–208
 - Mediator, 204, 206–208
- Domain taxonomy, 153–156
- Emotional goals, 12, 39
- Empirical user studies, 91–112
 - behavioural, 91–93
 - psychological, 93–112
- Episodic memory, 124–128
 - Maps-in-the-Classroom-Case, 126–127
- Euromath project, 131–133
- Evaluation criteria, 14, 36, 146–156
- Exact match, 72–73
 - intermediary role, 88, 166–171
- Experience, 16, 100, 127, 138, 141–144, 212
- Experienced user, 142–144, 211–212
- Expert user, 141–144
- Explanation function, 109, 204, 218–219
- Explicit semantic values, 197–200
- Extended Boolean logic, 74, 185
- Faceted classification, 64
- Fallout, 79
- Familiarity effect, 114
- Feedback, 78, 89, 195,
 - Euromath system, 168–171
 - frequency analysis, 183–186
 - influence in IR, 100–102, 104
- Feedback Generator, 204, 214–215
- Forecasting, 185
- Formalized need, 113–115
- Fiction retrieval, 104–105, 164–166, 207
- Fixed searching, 100–101
- Frontend, use Intermediary
- Functional use assessment, 150, 222
- Generators of information, 136
- GRANT system, 71, 179
- Heading hierarchies, 200
- Hermeneutic circle, 42
- Hermeneutics, 41–47
 - and cognitive viewpoint, 41–45, 196
 - Car-driving Case, 44–45
 - IR interaction, 45–47, 188, 196
 - IR systems design, 46–47, 188
- Horizon (hermeneutics), 42, 188
- Horizontal paradigmatic structures, 145–146
- Human-computer interface, 186–194
- Hyperline, 186

- I3R, 161–164, 188
- Icon-based IR, 166, 200
- Ill-defined requests, 115–118
- Implicit semantic values, 197–200
- Indexer aboutness, 50–51, 64–65
- Indexer inconsistency, 51, 65, 77
- Indexing theories, 50–54
- Indexing vs classification, 51
- Individual cognitive structures, 124–132
- Informatics, 5–6
- Information
 - and meaning, 24–25, 43, 191–197
 - as metaphor, 28,
 - as potential, 31–33,
 - as structure, 29, 31
 - as text, 26
 - conditions, 33–34
 - interpretations, 22, 26–34
 - operationality, 34–35
 - recipient-controlled, 11, 22, 27, 29–31
 - reduction to structured data, 21, 25, 196, 224
 - understanding in IR, 60, 63, 85, 159
- Information concept, 33
 - implications, 34–37
 - operationality, 34–35, 97
- Information concepts, 26–34
- Information management, 12, 36, 176–178
- Information metaphors, 28
- Information need, 107, 111, 112–118
 - formation, 112–116
 - types, 116–118, 216–217
- Information processing
 - cognitive viewpoint, 16, 22
 - cognitivistic, 20
 - computerized, 25
 - four stages, 22–23
- Information quality, 150, 155–156
- Information retrieval, use also IR
 - advanced model, 55,
 - cognitive models, 16, 55, 135, 148
 - contextual theory, 194–201
 - definition, 49
 - natural language use, 190–202
 - simple model, 49
 - supportive disciplines, 8, 60, 86, 159
- Information retrieval interaction,
 - see IR interaction
- Information science, 1–14
 - as cognitive science, 8, 37–40
 - cognitive viewpoint, 15–19,
 - communication, 5, 26–27
 - computer science, 5
 - foundations, 1–8
- formulations, 10–11
- future trends, 13–14
- information concepts, 26–34
- interdisciplinarity, 3–4, 8
- machine translation, 23, 81
- problem solving, 12
- scope, 11–14
- sub-disciplines, 12–13,
- theory generation, 4, 14
- turning point, 9–11
- Information sciences, 4
- Information searching behaviour, 85–86, 133, 209–210
- Information seeking model, 86
- Information space, 134–136, 163, 165
 - nearness, 199
- Informativeness, 152, 197
- Informatology, 7
- Informetrics, 12, 36
- Input Analyst function, 109, 219–220
- Institute of Information Scientists, 1–2
- Intelligent IR, 58–59, 108, 111–112, 139, 176
 - designs, 158–164, 171–178, 191–194
 - research goals, 193
 - vs supportive IR, 178–181
- Intentionality, 34, 138–140, 187–188
- Interactive graphics, 166, 186–187
- Interface, use Intermediary
- Intermediary
 - role in IR, 87–91
- Intermediary behaviour, 100–112
- Intermediary design, 101, 120, 136–140, 143–144, 204–220
 - knowledge-based, 160–175, 206–222
 - meta-characteristics, 174–178, 204–206
- Intermediary functions
 - analytic, 88–91,
 - empirical, 101–112, 136–140, 206–220
 - Mediator, 204–221
 - Monstrat, 106–110
- Interpretation, 24, 43
- IR-NLI system, 171–173
- IR experience, 141–145, 168–171
- IR expert systems, 111, 161–164, 171–174,
- IR interaction
 - advanced, 148
 - cognitive models, 16, 55, 134–144, 148
 - cognitive viewpoint, 16–18, 36
 - contextual theory, 194–201
 - definition, 1
 - design & evaluation, 146–156, 220–222
 - hermeneutics, 45–47
 - Highway Case, 198–199

- IR interaction (cont.)
 - knowledge-based, 161–164, 167–201, 204–222
 - Map-in-the-Classroom Case, 126–128
 - natural language use, 190–202, 216–217, 219
 - simplistic, 55–56
 - supportive disciplines, 8, 60, 63, 86, 159
- IR knowledge, 91, 110, 136–144, 168–171, 173–174, 178, 181, 209–212
- IR research
 - cognitive, 157–202, 225
 - overview, 57–60
 - traditional, 61–81
 - user-oriented, 83–122
- IR specialist, 141–144
- IR techniques, 72–77, 157, 179, 200, 208
- Isness vs aboutness, 53
- KIRA system, 167–168
- Knowledge-based IR, 58–59, 158, 160–202
 - adaptive IR interaction, 180–183, 186–194
 - contextual theory, 194–201
 - intelligent IR, 58–59, 108, 111–112, 139, 158–164, 171–181, 191–194
 - intermediary designs, 160–175
 - supportive position, 164–171, 173, 181–186
 - user model building, 161–164, 168–173, 175–181
- Knowledge states
 - individuals, 131–133, 141–145
- Knowledge structures, 16, 18, 31–32
 - in IR interaction, 131–146, 160
 - individual, 125–131
 - information space, 134–136
 - intermediaries, 136–140
 - Maps-in-the-Classroom-Case, 127–127
 - users, 141–144
- Knowledge blocks
 - design, 138–140, 160–175, 221–222
- KWOC, 69
- Label effect, 116–118, 178, 198
- Language philosophy, 24–25, 195–196
- Language understanding, 23, 81, 190–202
- Learning effects, 141–145
- Librarianship, 2, 4
- Library science, 4
- Local IR systems, 177–178
- Logical uncertainty principle, 197–200
- Long Term Memory, 124–128
 - Maps-in-the-Classroom-Case, 126–127
- Luria's experiments, 128–129
- Machine learning, 173, 222
- Machine translation, 23, 81, 224
- Manipulate function, 219
- Mapping function, 204, 217–218
- Maps-in-the-Classroom Case, 22, 125–127
- Mark Twain Painting Case, 24–25, 43, 200
- Meaning
 - and aboutness, 52, 196–200
 - and information, 11, 23, 25, 43, 191–197
 - and interpretation, 41–42, 194–198
- Mediator model, 203–222
 - and Monstrat, 205–206
 - applications, 220–222
 - functions, 204, 221–222
 - premises, 205–206
 - sources, 203
 - sub-functions, 206–220
- MEDLARS evaluation, 88
- Mental models, 124–125
- Mental representation, 24, 43–44, 195–196
- Mentalistic theory, 195
- Methodological combinations, 94–95, 148–150
- Monadic stage/level, 22, 196
- Monstrat model, 106–112
 - and Mediator, 205–206, 210–213
 - critique, 110–112
 - functions, 107, 114
 - properties, 108
 - sub-functions, 109
- Morpho-syntactic parsing, 196–200
- Muddled need, 116–18, 169
- Natural language dialogue, 186–187, 190–194
- Natural language processing, 161–162, 175, 190–202
 - pseudo, 161, 167
- Natural language representation, 67–75, 158
 - in context, 69–70
 - single terms, 68–71
 - structured, 68
 - weighting, 70–75
- Nearness – in information space, 199
- Neural nets, 210, 218
- NLR, see Natural language representation
- NLP, see Natural language processing
- Non-specialist, 142–144
- Novice user, 142–144, 183
- OAKDEC system, 173–174
- Object-oriented design, 167–168, 200
- Objective knowledge (Popper), 9–10
- Objective representation, 51–52
- Observational methods, 92, 97, 99, 103–105

- Office work, 149–150, 168, 178
 Online IR interaction, 103–104, 118–120, 190
 Open questions, 99, 101–103
 Open searching, 100–101
 Organisational environment, 147–150, 152–156,
 207–208
 Output Generator function, 109, 219–220
- Paradigmatic structures, 145–146, 207
 Parsing, 161–164, 196–200
 Partial match techniques, 72–77, 162–163, 166, 200
 Perception of concepts, 101, 127, 200
 Personal .., see Individual
 Pertinence, 151
 Planner function, 108, 204, 219–220
 Plausible inference, 157, 200
 Plexus system, 164
 Poly-representation, 36–37, 44, 53, 158, 194–197
 information need, 117, 202, 217
 Popperian ontology, 9–10,
 Post-interviews, 97
 Potential information, 31–33
 types, 36, 47
 Pre-information searching, 85–86
 Pre-search interviewing, 105–112,
 Pre-search studies – limitations, 110,
 Pre-suppositions, 23, 42, 52, 196–197
 Pre-understanding, 42, 188
 PRECIS, 65, 69
 Precision and recall, 79
 Probabilistic model, 74–75, 163
 Problem Description function, 109, 215–217
 Problem solving, 148
 Problem space, 27–28, 55–56, 106, 113, 131–133
 Problem statement, 106, 111, 199, 216–217
 Problematic situation, 27, 130
 Protocol analysis, 97–110
 Pseudo NLP, 161
- Quality assessment, 155–156
 Qualitative methods, 93–99
 obtrusiveness, 95–96
 experimental settings, 96–99, 103–106
 Query vs request, 56
 Question formation, 112–116
 Question analysis, 118–119
 Quorum searching, 186
- Ranganathan
 facets, 64
 five laws of practice, 2–3
 Recall and precision, 79
 Recording, 94–99, 101–110
 Reduction of information, 21, 25, 196, 224
 Reduction of uncertainty, 26–27
 Redundancy of representations, 195–196
 Relevance
 and aboutness, 54–55
 measurements, 78–80, 151–152
 Relevance feedback, 78, 89
 Representation
 formal type, 53
 IR systems, 36–37, 50–54, 63–71
 Mark-Twain-Painting-Case, 24–25
 mental, 24, 43–44, 124–134, 145, 196
 objective, 51–52
 redundancy, 195–196
 topical type, 53
 Request-oriented indexing, 52–53
 Request aboutness, 52, 80
 Request model building, 137–139, 161–164, 170–
 171
 Request Model Builder function, 161–164, 204,
 215–217
 Request vs query, 56, 73, 113, 216
 Resolving power, 71
 Response Generator function, 109, 204, 213–215
 Retrieval modes, human, 100–105
 Retrieval Strategy function, 109, 204, 212–213
 Retrieval uncertainty, 54, 194–197
 Roles and links, 65–66, 200
- SAP method, 69–70, 200
 Scientific communication, 2, 12
 Scientometrics, 12
 Searcher types, 141–145, 211–212
 Searle against cognitivism, 19–21
 Seeking behaviour, 85–86, 133, 178, 209–210
 Self-regulation, 225
 Semantic maps, 22, 126, 162,
 user generated, 167
 Semantic memory, 124–131
 Semantic values, 130, 166, 196–202, 217
 Semi-fixed searching, 100–101
 Semiotics, 195
 Sense-making theory, 152
 Shallow knowledge, 43, 143
 Shared knowledge, 18, 181, 188
 Sheffield school, 92
 Short Term Memory, 124–128
 Maps-in-the-Classroom-Case, 126–127
 Rent-a-Car-Case, 127
 Similarity searching, 146,
 SIMPR project, 70, 200

- Single terms
 in context, 69–70
 NLR, 68–75
 weighting, 70–71, 73–75
- Situational categorisation, 66–67, 102–103, 128–131, 144, 194, 198–200
- SMART system, 76
- Social environment, 146–149, 152–156
- Social interaction, 10
- Spin-off effects, 147, 150
- Spreading activation, 179
- Stand-alone systems, 90, 161–164, 176
- State of knowledge, 29–30, 33, 42–43, 131–133, 141–144, 178, 209–212
- State of uncertainty, 27–28, 46, 113, 131–133
 induction, 35, 97
- Strong AI, 19–20, 192
- Structural stage/level, 22–23, 196
- Structured NLR, 68
- Structured questioning, 130, 198–200, 216–217
- Subject specialist, 142–144
- Subjective knowledge (Popper), 9–10
- Supervisor function – Mediator, 217–218
- Supportive IR, 59, 108, 164–171, 175–179, 181–186, 194–202
 vs intelligent IR, 178–181
- Supportive user model building, 181–183, 186–194, 197, 209–212
- Supportive disciplines, 8, 60, 86, 159
- Surface knowledge, 43, 143, 183
- Syntax error syndrome, 47
- System adaption, 189–190, 211, 221–222
- System feedback, 78, 89, 100–101, 104, 168–171
- System Model
 Mediator, 204, 208–209
- System Model Adaptor function, 204, 211
- System objects, 148, 153, 206–208
- System setting, 136–140, 148, 186–187, 208–209
- Taylor's question formation, 112–116, 140
- Taylor's five filters, 114
- Term frequency analysis, 170, 183–186, 215
- Term weighting, 70–71, 73–77
- Term clustering, 77
- Tf.idf formular, 71, 184–185
- Thesaurus theory, 66–67,
- Thinking aloud method, 94–101, 116–117
- Thrownness, 44–46, 129, 182–183
- Time flies like an arrow, 23, 196–198
- Traditional IR research, 58, 61–81
 characteristics, 62–63
 history, 61–62
- Transformer function, 204, 219–220
- Transparency, 164, 179, 187–189, 205
- Uncertainty, 14, 54, 192, 194–202
 in investigations, 95–96
- Uncertainty reduction, 26–27
- Uncertainty state, 27–28, 46, 113, 131–133
- Use of information, 152–156
- User – role in IR, 87–91
- User-librarian interaction, 99, 101–106
- User-oriented IR research, 58, 83–122
 analytic studies, 112–120
 characteristics, 84–87
 empirical studies, 91–112
 history, 83–84
 qualitative (psychological) methods, 93–99
 quantitative (socio-behavioural) methods, 91–93
- User aboutness, 52, 65, 105, 196–197
- User interface, use Intermediary
- User knowledge, 141–146
- User Model, 109, 204, 209–210
- User models, 109, 119, 137–142, 161–166, 209–210
 implicit, 171–173
- User model building, 137–140, 161–164, 171–173, 175–183, 211–212
 purpose, 178–181
- User Model Builder function, 204, 211–212
- User preferences, 132–133, 146, 164–166, 178–179, 186–187, 209–211
- User satisfaction, 152
- User types, 141–145, 211–212
- Utility, 152
- Vector space model, 73–74, 200
- Verbal protocol analysis, 97–110
- Verificative need, 116–118
- Vertical paradigmatic structures, 145–146
- Video cameras, 94, 103–104
- Weak AI, 20–21, 192
- Wittgenstein, 24–25, 196
- Work domain taxonomy, 153–156, 221–222
- Work space, human, 113, 131–133, 147–148
- Work tasks, 178–179, 186–187, 196, 207–208, 210
 investigations, 92, 100–103, 148, 153–156, 207
- Zipf's rank-frequency, 70
- ZOOM analysis, 170–171, 183–186, 194