

Contents

Preface to the fifth edition	xv
I THINKING IN GENERAL	1
1 What is thinking?	5
1.1 Types of thinking	5
1.2 The search-inference framework	7
1.3 Thinking about beliefs	10
1.4 How do search processes work?	13
1.5 Problem solving	15
1.5.1 Trial and error versus insight	16
1.5.2 Problem-solving methods	19
1.6 Expertise	20
1.7 Heuristics	21
1.8 Knowledge, thinking, and understanding	23
1.8.1 Naïve theories	23
1.8.2 Understanding	27
1.9 Conclusion	32
2 The study of thinking	33
2.1 Descriptive, prescriptive, and normative	33
2.2 Methods for empirical research	36
2.2.1 Observation	36
2.2.2 Computer models and artificial intelligence	48
2.2.3 General issues	49
2.3 Development of normative models	53
2.4 Descriptive models	55
2.4.1 Purely mathematical models	55
2.4.2 Heuristics: Good and bad	55
2.4.3 Information flow models	57
2.4.4 Diffusion models	58

2.4.5	Coherence models	59
2.4.6	Reflection/impulsivity	59
2.4.7	Dual processes	60
2.5	Development of prescriptive models	62
2.5.1	Nudges	62
2.6	Classification of biases	64
2.7	Conclusion	66
3	Rationality	67
3.1	Good thinking and goal achievement	67
3.1.1	Optimal search	68
3.1.2	The meaning of rationality	69
3.1.3	Rationality and luck	70
3.1.4	Objections to rationality	71
3.2	Rationality and emotion	73
3.3	Rationality and belief	76
3.3.1	Rational belief formation	76
3.3.2	Self-deception	76
3.3.3	Beliefs, desires, and goals	79
3.4	Are people ever really irrational?	79
3.5	Conclusion	80
4	Logic	81
4.1	What is logic?	81
4.2	Types of logic	84
4.3	Difficulties in logical reasoning	86
4.4	Mental models	88
4.5	Errors in logical reasoning	92
4.5.1	Effects of prior belief: Belief bias	92
4.5.2	The four-card problem	93
4.5.3	Dual processes and rationalization	95
4.5.4	Content effects	97
4.6	Extensions of logic	98
4.7	Fallacies in informal logic	102
4.8	Conclusion	104
II	PROBABILITY AND BELIEF	105
5	Normative theory of probability	109
5.1	What is probability?	112
5.1.1	The frequency theory	112
5.1.2	The logical theory	114
5.1.3	The personal theory	115

CONTENTS

vii

5.2	Aleatoric vs. epistemic uncertainty	117
5.3	Constructing probability judgments	119
5.3.1	Probability as willingness to bet	119
5.3.2	Comparison with a chance setup	120
5.4	Well-justified probability judgments	121
5.4.1	Coherence rules and expected utility	123
5.5	Evaluating probability judgments	125
5.5.1	Calibration	126
5.5.2	Scoring rules	127
5.6	Bayes' theorem	129
5.6.1	An example from medicine	129
5.6.2	Formulas for Bayes' theorem	131
5.6.3	Why frequencies matter	134
5.6.4	Coincidences	136
5.6.5	When Bayes' theorem is useful and when it isn't	138
5.6.6	The Monty Hall problem	138
5.7	Conclusion	140
6	Descriptive theory of probability judgment	141
6.1	Accuracy of probability judgments	141
6.1.1	Frequency judgments	141
6.1.2	Calibration and inappropriate extreme confidence	143
6.1.3	Improving calibration by conditional assessment	148
6.2	Heuristics and biases in probability	150
6.2.1	The representativeness heuristic	150
6.2.2	The availability heuristic	156
6.2.3	Subadditivity	159
6.2.4	Hindsight bias	159
6.2.5	Averaging	161
6.3	Conclusion	162
7	Hypothesis testing	163
7.1	Hypotheses in science	164
7.1.1	An example from medicine	164
7.1.2	Testing scientific hypotheses	167
7.2	The psychology of hypothesis testing	171
7.2.1	Concept formation	171
7.2.2	Congruence bias	172
7.2.3	Information bias and the value of information	178
7.2.4	Utility and alternative hypotheses	181
7.3	Conclusion	182

8	Judgment of correlation and contingency	183
8.1	Correlation, cause, and contingency	183
8.2	Accuracy of judgment	185
8.3	Attentional bias	186
8.3.1	Attentional bias in judging correlation	186
8.3.2	Attentional bias in judging contingency	188
8.4	Effects of prior belief: Illusory correlation	191
8.4.1	Personality traits	192
8.4.2	Prior belief and attentional bias	194
8.4.3	Understanding theory and evidence	194
8.5	Conclusion	196
9	Actively open-minded thinking (AOT)	197
9.1	Example of AOT	199
9.2	Myside bias and irrational belief persistence	200
9.2.1	Biases formed in the experiment: Pre-decisional distortion	202
9.2.2	Biases formed before the experiment	204
9.3	Individual differences in AOT	208
9.4	Determinants and related phenomena	213
9.4.1	Standards for thinking	213
9.4.2	Distortion of beliefs by desires	214
9.5	Factors that moderate belief persistence	218
9.5.1	Accountability	218
9.5.2	Stress	218
9.5.3	Groupthink	219
9.6	Conclusion	220
III	DECISIONS AND PLANS	221
10	Choice under uncertainty: Normative theory	225
10.1	Expected-utility theory	229
10.1.1	Expected value	229
10.1.2	Expected utility	230
10.1.3	Other examples of comparison of errors	233
10.2	Why expected-utility theory is normative	235
10.2.1	The long-run argument	235
10.2.2	The argument from principles	236
10.3	The utility of money	240
10.4	Rules and heuristics	245
10.5	Conclusion	246

CONTENTS

ix

11 Choice under uncertainty	247
11.1 Experienced, predicted, and decision utility	247
11.2 Bias in decisions under uncertainty	249
11.2.1 The Allais paradox	249
11.3 Prospect theory	251
11.3.1 Probability: The π function	252
11.3.2 Utility: The Value function and framing effects	256
11.3.3 Prospect theory: limitations, extensions, and alternative ap- proaches	260
11.4 Emotional effects of outcomes	261
11.4.1 Regret and rejoicing	261
11.4.2 Disappointment and elation	262
11.4.3 The role of regret in decisions	262
11.4.4 Rationality of anticipated emotions in decision making	264
11.5 The ambiguity effect	264
11.5.1 Ambiguity and “unknown probability”	265
11.5.2 Rationality of the ambiguity effect	266
11.5.3 Aversion to missing information	267
11.5.4 Ambiguity and adjustment of probability	268
11.6 Uncertainty and reasons for choice	269
11.7 Conclusion	269
12 Risk	271
12.1 Normative theory	271
12.2 Risk regulation and the intuitions that support it	273
12.2.1 The psychometric approach	274
12.2.2 Voluntary versus involuntary	275
12.2.3 Known versus unknown	277
12.2.4 Catastrophic versus individual	277
12.2.5 Benefit	278
12.3 Other biases in risk judgments	278
12.3.1 Neglect of probability	279
12.3.2 Denominator neglect	280
12.3.3 Proportion dominance	280
12.3.4 Zero risk	283
12.3.5 Individual versus statistical	283
12.3.6 Natural versus artificial	284
12.3.7 Omission versus commission	285
12.3.8 Intuitive toxicology and naïve theories	285
12.4 Insurance and protective behavior	286
12.4.1 Compensation	286
12.4.2 Declining marginal utility	287
12.4.3 Ambiguity and insurance	288
12.4.4 Investment	289

12.5 Individual and gender differences	292
12.6 Conclusion	294
13 Choice under certainty	295
13.1 Prominence and single-mindedness	295
13.2 Other reversals: Compatibility and evaluability	298
13.2.1 Response mode compatibility	298
13.2.2 Evaluability and joint versus separate evaluation	300
13.3 Effects of the options available on choice	301
13.3.1 Asymmetric dominance	301
13.3.2 Compromise	302
13.4 Mental accounting	302
13.4.1 The status quo (endowment) effect	303
13.4.2 Default bias	305
13.4.3 Emotional effects of the reference point	306
13.4.4 Opportunity costs	307
13.4.5 Integration and segregation	308
13.4.6 The extra-cost effect	310
13.4.7 The sunk-cost effect	311
13.4.8 The reference price	313
13.5 Conclusion	314
14 Utility measurement	315
14.1 Decision analysis and related methods	315
14.1.1 The Oregon Health Plan	316
14.1.2 Decision analysis versus cost–benefit analysis	317
14.2 The measurement of utility	320
14.2.1 Utility measurement as prediction	320
14.2.2 Direct versus indirect judgments	320
14.2.3 Simple direct judgment and the analog scale	322
14.2.4 Difference measurement	324
14.2.5 Standard gambles	325
14.2.6 Time trade-off and person trade-off	328
14.2.7 Adaptation and point of view	330
14.2.8 Other methods involving matching and comparison	331
14.2.9 Contingent valuation (CV)	334
14.2.10 Disagreement among measures	337
14.3 Conclusion	338
15 Decision analysis and values	339
15.1 Fundamental versus means values	339
15.2 Discovering values	341
15.2.1 Objectives of hiring a new faculty member in psychology	342
15.2.2 People have trouble generating relevant values	344

CONTENTS

xi

15.2.3 Proactive and reactive decisions	345
15.3 Theoretical issues in MAUT	346
15.3.1 Conjoint measurement	346
15.3.2 Analysis into attributes	348
15.3.3 Attribute weights	349
15.3.4 Conjoint analysis	351
15.3.5 The false difficulty of close decisions	351
15.4 Rules and trade-offs	352
15.4.1 Simple heuristics, and elimination by aspects	353
15.5 The value of human life	356
15.6 Conclusion	358
16 Quantitative judgment	359
16.1 Scale convergence	360
16.2 Multiple linear regression	361
16.3 The lens model	363
16.4 Improving human judgment	369
16.5 The mechanism of judgment	370
16.5.1 Do people really follow linear models?	370
16.5.2 Averaging vs. adding	372
16.5.3 Representativeness in numerical prediction	373
16.5.4 Anchoring and underadjustment	375
16.6 Classification by similarity to exemplars	376
16.7 Conclusion	378
17 Moral judgment and choice	379
17.1 What are moral judgments?	381
17.1.1 Moral judgments are like imperatives	381
17.1.2 Universality	382
17.1.3 Objectivism and subjectivism	384
17.2 Types of judgment	385
17.2.1 Morality versus convention	385
17.2.2 Social norms	386
17.3 Utilitarianism as a normative model	387
17.3.1 Moralistic goals	389
17.3.2 Frequently asked questions about utilitarianism	390
17.3.3 Deontological rules	395
17.3.4 Rule utilitarianism	397
17.4 Biases and intuitions in moral judgment?	398
17.4.1 Protected values (PVs)	399
17.4.2 Omission bias	400
17.5 Conclusion	403

18 Fairness and justice	405
18.1 The study of fairness and justice	406
18.2 Equity theory: The desire for justice	407
18.3 Utilitarianism and fairness	408
18.4 Intuitions about fair allocation	412
18.5 Heuristics and self-interest	421
18.6 Negotiation	421
18.7 Conclusion	426
19 Social dilemmas: Cooperation vs. defection	427
19.1 Laboratory versions	428
19.1.1 Prisoner's dilemma	428
19.1.2 Effects of repetition	429
19.1.3 N-person prisoner's dilemma	429
19.2 Normative and prescriptive theory	431
19.3 Motives in social dilemmas	433
19.3.1 Altruism	434
19.3.2 Competition	435
19.3.3 Fairness, equality, and envy	436
19.3.4 Fear and greed	436
19.3.5 Reasons for doing what others do	437
19.4 Trust	438
19.5 Voters' illusions	440
19.6 Parochialism	443
19.7 Solutions to social dilemmas	444
19.7.1 Experimental approaches	445
19.7.2 Social reform	449
19.8 Conclusion	450
20 Decisions about the future	451
20.1 The choice of personal goals	453
20.2 Good reasons for sticking to plans	455
20.3 Bad reasons for sticking to plans: Biases	456
20.4 Discounting	457
20.4.1 Economic theory of discounting	458
20.4.2 Normative theory of discounting	460
20.4.3 Descriptive data on discounting	462
20.4.4 The rationality of personal discounting	466
20.5 Self-control	467
20.5.1 Why we need self-control	468
20.5.2 Methods of self-control	469
20.6 Emotions and time	471
20.7 Adaptation, contrast, and heuristics	472
20.8 Morality and prudence	474

<i>CONTENTS</i>	xiii
20.9 Conclusion	474
References	475
Author Index	515
Subject Index	523