

1 Introduction	1
References	4
2 Systems Engineering (SE)—Old Thinking in a New Guise	5
2.1 SE as a Scientific Discipline	7
2.2 Systems Thinking as an Opportunity for Complexity Management in the Past	11
2.3 The New Dimensions of Complexity and Their Requirements for SE	14
2.4 The Evolution of SE	26
2.4.1 Universal SE Concepts	28
2.4.2 Discipline-Specific Approaches to SE	40
2.4.3 Comparative Consideration of Universal and Special SE Approaches	59
2.5 SE and Possibilities of its Reformability	62
References	69
3 Generic Systems Engineering—An Approach to Mastering Complexity in a New Dimension	79
3.1 The Synergy between the Thinking Model and the Procedural Concept—A Necessary Condition in GSE	80
3.2 The Demands on the Thinking Model of the GSE	85
3.3 The Possibilities of Restoring a General Procedural Concept within the Framework of the GSE	97
3.4 The First Draft of a GSE and Ideas for Its Further Development	106
References	115
4 System Modeling in the GSE Approach	121
4.1 Derivation of the Views for System Modeling	123
4.2 Derivation of the Description Possibilities of the Interrelationships in and Between the Views in System Modeling	134
4.3 General Description of Systems with the Metamodel (e-)DeCoDe	145

4.4	Possible Sequence of Steps for Creating the GSE Thinking Model for Technical Systems with DeCoDe	159
4.5	Possible Sequence of Steps for Creating the GSE Thinking Model for Sociotechnical Systems with e-DeCoDe	175
4.6	The Advantages and Disadvantages of System Modeling in the GSE Approach	184
	References	185
5	The Modules of the GSE Procedural Concept—Mastering Complexity Using Simple Rules.	195
5.1	The GSE Analysis Module	199
5.2	The GSE Goal Formation Module	209
5.3	The GSE Design Module	220
5.4	The GSE Project Management Module	230
5.5	The Interaction of the Modules of the GSE Procedural Concept and the Consequences for System Modeling	242
5.6	Summary of the Modules of the GSE Procedural Concept	263
	References	264
6	Case Studies—Managing New Dimensions of Complexity With GSE.	271
6.1	Requirement Update in Product Development	274
6.2	Development of Mechatronic Systems	281
6.3	Reliability Considerations of Mechatronic Systems Over the Product Life Cycle	289
6.4	Failure Identification in Critical Usage Processes by BIELEFELD	297
6.4.1	MemogaFa—Methodology for a Model-Based and Holistic Failure Analysis	301
6.4.2	Validation of the Methodology	304
6.4.3	Conclusion and Outlook	313
6.5	Model-based Field Data Feedback into Product Development of MAMROT	314
6.5.1	Application of GSE Using the Example of Model-Based Field Data Feedback	315
6.5.2	Insights from the Newly Developed Method of Field Data Feedback for the GSE	320
6.6	Failure Cause Search and Solution Algorithm by HEINRICHSMEYER	321
6.6.1	Concept of the Failure Cause Search and Solution Algorithm	321
6.6.2	Failure Cause Localization	322
6.6.3	Theoretical Implementation	323
6.6.4	Practical Implementation	325
6.6.5	Validation of Implementation	327
6.6.6	Discussion	328

6.6.7	Outlook.	330
6.7	Early Stages of Customer-Integrated Product Development of Industrial Plants	331
6.7.1	Application of the GSE Approach in the Customer-Integrated Development of an Emergency Release for Industrial Plants	332
6.7.2	Risks and Opportunities of GSE in the Early Stages of Product Development	336
6.8	Requirement-Appropriate Organizational Development of MISTLER. . . .	337
	References.	361
7	The New Guise of SE—GSE as a Solution Variant	365
	References.	375