

Contents

1	Introduction	1
1.1	Objectives of This Chapter	1
1.2	Motivation	1
1.3	Software Process Modeling and Improvement	6
1.4	Process Modeling Goals and Benefits	7
1.5	Terminology	8
	References	17
2	Prescriptive Process Models	19
2.1	Objectives of This Chapter	19
2.2	Introduction	20
2.2.1	Prescriptive vs. Descriptive Models	20
2.2.2	The Product–Process Relationship	21
2.2.3	Prerequisites	22
2.3	Prescriptive Process Model Classes	24
2.3.1	Lifecycle Process Models	24
2.3.2	Engineering Process Models	37
2.4	Process Standards	44
2.4.1	ISO/IEC 12207:2008	45
2.4.2	IEC 61508	46
2.4.3	ISO 26262	55
2.4.4	IEC 62304	57
2.5	Process Representations in Organizations	58
2.5.1	Process Handbooks	58
2.5.2	Electronic Process Guides	63
2.6	Deploying Prescriptive Process Models	65
2.6.1	Deployment Strategies	66
2.6.2	An Exemplary Deployment Approach	69
2.6.3	Experience from Industrial Practice	74
	References	75

3	Descriptive Process Models	79
3.1	Objectives of This Chapter	79
3.2	Introduction	80
3.3	Goals of Descriptive Process Modeling	80
3.3.1	Stable and Accurate Process Execution	80
3.3.2	Process Understanding	81
3.3.3	Process Propagation	81
3.3.4	Process Measurement	82
3.3.5	Process Administration	82
3.3.6	Process Automation	83
3.4	Creating a Descriptive Process Model	83
3.4.1	Approach Overview	84
3.4.2	Step 1: State Objectives and Scope	86
3.4.3	Step 2: Select or Develop a Process Modeling Schema	88
3.4.4	Step 3: Select (a Set of) Process Modeling Formalisms	91
3.4.5	Step 4: Select or Tailor Tools	93
3.4.6	Step 5: Elicitation	94
3.4.7	Step 6: Create the Process Model	96
3.4.8	Step 7: Analyze the Process Model	97
3.4.9	Step 8: Analyze the Process	99
3.5	Descriptive Process Modeling Alternatives	100
3.5.1	Multi-view Process Modeling	100
3.5.2	Elicit	102
3.6	Guidelines for Process Elicitation Interviews	104
3.6.1	Interview Preparation	104
3.6.2	Beginning the Interview	105
3.6.3	The Main Interview	105
3.6.4	Interview Closure	106
3.7	Managing Risk in Descriptive Process Modeling Efforts	107
3.7.1	Resistance of Participants	107
3.7.2	Inaccurate Reporting	108
3.7.3	Underestimating Necessary Investments	109
3.7.4	Underestimating Process Model Complexity	110
	References	110
4	Process Modeling Notations and Tools	111
4.1	Objectives of This Chapter	111
4.2	Introduction	112
4.3	Criteria for Assessing Process Modeling Notations	112
4.3.1	Characteristics of Process Modeling Notations	113
4.3.2	Requirements for Process Modeling Notations	114
4.4	Multi-view Process Modeling Language	116
4.4.1	Overview	116
4.4.2	Concepts	116
4.4.3	Notation Constructs	117

4.4.4	Instantiation and Enactment	122
4.4.5	Assessment with Respect to the Defined Criteria	127
4.5	Software Process Engineering Metamodel	127
4.5.1	Overview	127
4.5.2	Concepts	128
4.5.3	Notation Constructs	130
4.5.4	Assessment with Respect to the Defined Criteria	131
4.6	Tools for Software Process Modeling	131
4.6.1	The ECMA/NIST Reference Model	132
4.6.2	The Eclipse Process Framework (EPF) Composer	136
	References	138
5	Process Improvement	139
5.1	Objectives of This Chapter	139
5.2	Introduction	140
5.3	Model-Based Improvement Approaches	143
5.3.1	Capability Maturity Model Integration	145
5.3.2	ISO/IEC 15504 (SPICE)	150
5.4	Continuous Improvement Approaches	152
5.4.1	PDCA Cycle (Deming Cycle)	153
5.4.2	Total Quality Management	153
5.4.3	Total Quality Control	155
5.4.4	Company-Wide Quality Control	156
5.4.5	Kaizen	157
5.4.6	Zero Defect Program	157
5.4.7	Six Sigma	158
5.4.8	The Quality Improvement Paradigm	160
5.4.9	The Experience Factory	161
5.5	Process Improvement and Measurement: The GQM Approach	162
5.6	Aligning Improvement Goals and Strategies with Business	164
5.6.1	The Balanced Scorecard	165
5.6.2	GQM ⁺ Strategies	166
	References	175
6	Empirical Studies	177
6.1	Objectives of This Chapter	177
6.2	Experiments	178
6.2.1	Controlled Experiments: Research in the Small	180
6.2.2	Case Studies: Research in the Typical	182
6.2.3	Surveys: Research in the Large	182
6.2.4	Experiment Sequences	183
6.3	Benefits	185
	References	185

7	Software Process Simulation	187
7.1	Objectives of This Chapter	187
7.2	Software Process Simulation	188
7.2.1	Continuous Simulation	191
7.2.2	Discrete-Event Simulation	192
7.2.3	Hybrid Simulation	193
7.2.4	Benefits	193
7.3	A Method for Developing Simulation Models	194
7.3.1	Requirements Identification and Specification	196
7.3.2	Process Analysis and Specification	198
7.3.3	Model Design	202
7.3.4	Model Implementation	204
7.3.5	Model Calibration, Validation, and Verification	204
7.4	Plug & Play Process Models	206
7.5	Combining Process Simulation and Empirical Studies	207
	References	209
8	Glossary	211
9	Authors	217
	Appendix	219
	Index	233

Software Process Definition and Management
Münch, J.; Armbrust, O.; Kowalczyk, M.; Soto, M.
2012, XX, 236 p., Hardcover
ISBN: 978-3-642-24290-8