

Content

1	Introduction and Types of Information Systems (IS) — 1
1.1	Significance of Information Systems (IS) — 1
1.1.1	Scope of View: What is an Information System and IS-Management? — 1
1.1.2	Environmental Influences — 4
1.1.3	Role of IS: Influence on Operations — 7
1.1.4	Role of IS: Influence on Strategy — 9
1.1.5	Significance of IS: Financial View — 10
1.1.5.1	Empirical Evidence — 10
1.1.5.2	The Concept of Total Cost of Ownership (TCO) — 14
1.1.5.3	IS Impact on the Return of Capital Employed (ROCE) — 16
1.2	Types of IT-Systems — 19
1.2.1	The Overall View on Information Systems — 19
1.2.2	Operative Transaction Processing Systems (TPS) — 22
1.2.3	Different Management Information Systems — 26
1.2.3.1	Management Information Systems (MIS) — 28
1.2.3.2	Decision Support Systems (DSS) — 29
1.2.3.3	Executive Support Systems (ESS) — 30
1.3	Processes as Dominant Objects of IS — 31
1.3.1	What is a Process? — 33
1.3.2	Definition and Documentation of Processes — 35
1.3.3	Computerization of Processes with Workflows and Workflow Management Systems (WFM) — 40
1.4	The Value Chain of IT-Companies — 43
1.5	Summary of Chapter 1 — 45
1.6	Literature for Chapter 1 — 45
1.7	Review Questions for Chapter 1 — 46
1.8	Suggestions for Written Exercise or Groupwork for Chapter 1 — 53
1.8.1	Total Cost of Ownership Concept — 53
1.8.2	Operative and Strategic Impact of Information Systems — 54
1.8.3	Research Success and Failure Stories — 54
2	Focus on Production Planning Systems (PPS) — 55
2.1	PPS at the Core of Industrial Manufacturing — 55
2.1.1	Manufacturing Process and Materials Management — 55
2.1.2	Functions of a PPS — 57
2.2	Important Master Data in a PPS — 60
2.2.1	Materials — 60
2.2.1.1	Bill of Materials (BoM) — 63

2.2.1.2	Categories and Types of BoM's — 65
2.2.1.3	How Bills of Material are Used in Production Planning — 69
2.2.2	Work Center — 70
2.2.3	Work Plan (in SAP Called "Routing") — 72
2.3	Production Planning — 74
2.3.1	Quantity Planning — 75
2.3.2	Scheduling of Production — 77
2.3.3	Capacity Planning and Capacity Leveling — 78
2.4	Production Control — 82
2.4.1	The Production Order (PO) — 83
2.4.2	Timing of Production Order — 88
2.4.2.1	Availability Check — 89
2.4.2.2	Releasing the Production Order — 90
2.4.3	Production Order Control via Manufacturing Execution Systems (MES) — 91
2.4.4	Work Order Completion Message in the ERP-System — 94
2.5	Summary of Chapter 2 — 94
2.6	Literature for Chapter 2 — 95
2.7	Review Questions for Chapter 2 — 95
2.8	Suggestions for Written Exercise or Groupwork for Chapter 2 — 104
2.8.1	Exploding BoM and scheduling — 104
2.8.2	MES and Below — 105
3	Integration of Information Systems: Forms, Methods and Concepts — 107
3.1	Introduction: Integration of Information Systems — 107
3.1.1	Direction, Methods and Automation of Integration — 108
3.1.2	Benefits and Risks of Integration — 109
3.1.3	Vertical Integration via Programs in Functional Silos — 111
3.1.4	Horizontal Integration via Programs — 113
3.2	Vertical Integration via Data Warehousing (DWH) — 114
3.2.1	Extract, Transform, Load Data into the Data Warehouse — 117
3.2.1.1	Extraction of Data from Operative Systems — 118
3.2.1.2	Transformation of Data — 119
3.2.1.3	Load and Storage of Data into a Persistent Database — 120
3.2.2	DWH Output: OLAP to Answer Known Information Needs — 121
3.2.3	DWH Output: Data Mining to Find Unknown Patterns and Correlations — 125
3.3	Horizontal Integration of Design and Production — 128
3.3.1	Knowledge Based Systems in (Mechanical) Design — 130
3.3.2	Product Data Management (PDM) and Product Data Lifecycle Management (PDL) — 131

3.3.3	Reasons for Implementing PDM — 133
3.3.3.1	Various Time Reductions by the Use of PDM — 134
3.3.3.2	Cost Reduction — 135
3.3.3.3	Quality Improvement — 135
3.4	Enterprise Application Integration (EAI) and Service Oriented Architecture (SOA) — 135
3.4.1	“Traditional” Means of Enterprise Application Integration Especially Middleware — 137
3.4.1.1	Database Middleware — 137
3.4.1.2	Remote Procedure Call (RPC) — 138
3.4.1.3	Object-Request-Broker (ORB) — 139
3.4.1.4	Message-Oriented Middleware (MOM) — 139
3.4.2	The Concept of Web-Services — 141
3.4.3	Extending Web-Service Standards for Business Needs — 143
3.4.4	IS-Integration: Towards a Real SOA — 145
3.5	Intercompany Integration via Exchange Standards — 147
3.5.1	Electronic Document Exchange Standards (EDI) — 149
3.5.2	Catalogue Exchange Standards — 149
3.5.3	Material Classifications Standards — 150
3.6	Summary of Chapter 3 — 150
3.7	Literature for Chapter 3 — 151
3.8	Review Questions for Chapter 3 — 151
3.9	Suggestions for Written Exercise or Groupwork for Chapter 3 — 160
3.9.1	Data Defects and OLAP — 160
3.9.2	CIM and Industry 4.0 — 160
4	ERP Systems: Basic Concepts and the Example SAP — 161
4.1	System Integration via ERP System — 161
4.1.1	Integration of Master Data — 162
4.1.2	Integration of Processes — 164
4.1.3	ERP Architecture — 168
4.1.3.1	History of IT Architecture for ERP Applications — 168
4.1.3.2	The “Classical” Three Tier Client-Server Approach of ERP Systems Architecture — 170
4.1.3.3	Current Developments in ERP Systems — 173
4.2	ERP Systems in the Market — 173
4.2.1	Current ERP Market — 173
4.2.2	Success of ERP Systems Implementation — 178
4.2.2.1	Success of Introduction Projects — 178
4.2.2.2	Success of Use — 180

4.2.3	ERP Components Exemplified by SAP — 183
4.2.3.1	The SAP Module PP and its Sub-Modules — 184
4.2.3.2	The SAP Sub-Sub-Module PP-BD-BOM — 185
4.2.3.3	Modules and Company Functions — 186
4.3	Detailed View on Structure of Objects in SAP Modules — 189
4.3.1	Enterprise Structure in Materials Management and Production Planning — 189
4.3.2	Enterprise Structure in Financial Accounting and Controlling — 193
4.3.3	Enterprise Structure in Sales — 197
4.4	Using an ERP system by the example of SAP — 199
4.4.1	Basic Look and Feel of the ERP System and Individual Settings — 199
4.4.2	System Roles and Transactions — 201
4.4.3	Access to the Training System — 203
4.5	Summary of Chapter 4 — 206
4.6	Literature for Chapter 4 — 207
4.7	Review Questions for Chapter 4 — 208
4.8	Suggestions for Written Exercise or Groupwork — 216
4.8.1	ERP Case Study — 216
4.8.2	Differences Between SAP and Competitors — 216
5	IT-Management — 217
5.1	The Big Figure: IT Service Management (ITSM) — 217
5.1.1	IT Governance — 220
5.1.2	IT Compliance — 222
5.2	IT Strategy and Business Alignment — 224
5.2.1	Basic Business Strategies and Tools – Used for IS strategy — 225
5.2.2	The Relationship Between Business and IT — 227
5.2.3	The Process and Results of an IS Strategy — 229
5.3	IT Service Management with the IT Infrastructure Library (ITIL) — 234
5.3.1	The Macro View and Logic of the ITIL Framework — 234
5.3.1.1	Service Orientation — 235
5.3.1.2	Focus on Processes — 237
5.3.1.3	Benefits and Challenges Using ITIL Processes — 238
5.3.1.4	Structure of the ITIL Framework — 239
5.3.2	Zoom in on Processes in the Stage of Service Transition — 248
5.3.2.1	Transition Process: Transition Planning and Support — 249
5.3.2.2	Transition Process: Release and Deployment Management — 250
5.3.2.3	Transition Process: Service Validation and Testing — 250
5.3.2.4	Transition Process: Evaluation — 251
5.3.2.5	Transition Process: Knowledge Management — 252
5.3.2.6	Transition Process: Service Assets and Configuration Management (SACM) — 252

5.3.3	Zooming in on the ITIL Service Process of Change Management (CM) in the Stage of Service Transition — 253
5.3.3.1	Processes of Change Management — 255
5.3.3.2	Roles and Institutions of Change Management — 260
5.3.3.3	Tools and Concepts of Change Management — 262
5.3.3.4	Interfaces of Change Management — 266
5.4	Other Frameworks and Approaches — 269
5.4.1	Cobit as a Framework for ITSM and IS Compliance — 269
5.4.2	IT-Controlling and Budgeting — 271
5.4.2.1	Functions and Processes of IT-Controlling — 271
5.4.2.2	Tools of IT-Controlling — 272
5.4.2.3	Portfolios as a Tool of Strategic Controlling — 273
5.4.2.4	Key Performance Indicators (KPIs) as Tool of Operative IT-Controlling — 274
5.4.2.5	Management Accounting and Transfer Pricing for IT Services — 276
5.5	Summary of Chapter 5 — 281
5.6	Literature for Chapter 5 — 282
5.7	Review Questions for Chapter 5 — 282
5.8	Suggestions for Written Exercise or Groupwork for Chapter 5 — 297
5.8.1	ITIL Process of Problem Management — 297
5.8.2	IS Governance and Strategy — 297
6	Planning and Preparing IS Development — 299
6.1	The Software Development Cycle — 299
6.1.1	Basic Cycle of Software Development — 301
6.1.2	A Broad Model of IS-Development — 303
6.1.3	“Classical” Approaches of Structuring Software Development — 305
6.1.3.1	The Waterfall Model — 306
6.1.3.2	Spiral Model and Prototyping — 308
6.1.3.3	Rational Unified Process (RUP) — 309
6.1.4	Agile Concepts — 311
6.1.4.1	Criticism Against Traditional Process Models and the Agile Manifesto — 312
6.1.4.2	Use of Agile Methods in Business Today — 313
6.1.4.3	The Dominant Agile Process Model: Scrum — 318
6.2	Business Plan and Outsourcing Decision — 321
6.2.1	The Business Plan – is it Worth it? — 321
6.2.1.1	Converting Technical and Organizational Impact into Financials — 324
6.2.1.2	Determining Feasibility and Data Sources of Alternatives — 329
6.2.1.3	Writing the Business Case and Using Evaluation Tools — 331

6.2.2	A Basic Decision in the Strategy Phase: Outsourcing —	338
6.2.2.1	Goals and Forms of IT-Outsourcing —	338
6.2.2.2	Evaluating the Outsourcing Decision and Preparation —	344
6.2.2.3	Service Level Agreements as a Frame of Managing Outsourcing Relationships —	349
6.3	Requirements Engineering (RE) —	353
6.3.1	Preparation and Management of Requirements Engineering —	354
6.3.1.1	Goals and Scope of Requirements Engineering —	355
6.3.1.2	Stakeholders' Interest as Base of Requirements Engineering —	356
6.3.2	Organizing and Executing Requirements Engineering —	358
6.3.2.1	The Requirements Engineering Process —	358
6.3.2.2	Creating Information for Requirements Engineering —	359
6.3.2.3	Requirement Workshop —	360
6.3.3	Types, Documentation and Management of Requirements —	362
6.3.3.1	Types of Requirements in a Specification Document —	362
6.3.3.2	Writing a Specification Document —	364
6.4	Selecting and Contracting Vendors —	368
6.4.1	Preparation and Preselection —	369
6.4.2	Scoring Model —	373
6.4.3	The Bid, Contract and Legal Matters —	377
6.5	Summary of Chapter 6 —	378
6.6	Literature for Chapter 6 —	379
6.7	Review Questions for Chapter 6 —	379
6.8	Suggestions for Written Exercise or Groupwork for Chapter 6 —	393
6.8.1	Scoring Model for Vendor Selection —	393
6.8.2	Software Creation Process Models —	394
6.8.3	Create a "Software Requirement Specification" for a PPS System —	394
6.8.4	Write a Business Case —	394
7	Creating and Introducing IS —	395
7.1	Systems Modelling, Design and Programming —	395
7.1.1	Modelling Systems and Architecture —	396
7.1.1.1	Behaviour Models and Diagrams —	398
7.1.1.2	Structure Diagrams —	400
7.1.1.3	Systems Architecture —	403
7.1.2	Programming and Customizing —	407
7.1.2.1	Software Programming —	407
7.1.2.2	Customizing Standard Software like ERP Systems —	407
7.1.3	Special Aspects of Project Management for Creating IS —	410
7.1.3.1	Project Planning and Estimation Techniques —	410

7.1.3.2	COCOMO as a Model of Parametric Estimation —	412
7.1.3.3	Project Organization and Team Members —	416
7.1.3.4	Controlling and Risk Control in Software Projects —	418
7.2	Testing and Quality Assurance —	423
7.2.1	Quality Management as a Frame for Testing —	423
7.2.1.1	Defining Software Quality —	424
7.2.1.2	Quality Systems —	424
7.2.1.3	Capability Maturity Model (CMM) —	426
7.2.2	Different Areas and Levels of Tests —	428
7.2.2.1	Unit Testing —	430
7.2.2.2	Systems Testing —	433
7.2.2.3	Release and Acceptance Testing —	435
7.2.3	Processes and Tools for Testing —	438
7.2.3.1	Organizing and Planning Tests —	438
7.2.3.2	Creating and Administrating Test Cases —	441
7.2.3.3	Managing the Bug Life Cycle —	443
7.2.3.4	Reporting of Test Advancement —	445
7.3	Preparing the Organization for Introduction —	446
7.3.1	Planning, Executing and Guiding Organizational Change —	447
7.3.1.1	Business Process Reengineering and Management —	448
7.3.1.2	Managing Organizational Change —	451
7.3.2	Training for New Information Systems —	453
7.3.2.1	Designing the Training Plan —	453
7.3.2.2	Measuring Training Success —	455
7.3.3	Introducing New or Improved Information Systems —	457
7.3.3.1	Go Live Readiness for Implementation —	457
7.3.3.2	Conversion Strategies for Implementation —	459
7.3.3.3	Stabilization and Early Live Support —	460
7.4	Summary of chapter 7 —	463
7.5	Literature for chapter 7 —	464
7.6	Review Questions for Chapter 7 —	464
7.7	Suggestions for Written Exercise or Groupwork for chapter 7 —	480
7.7.1	Creating a Test Case —	480
7.7.2	IT Project-Success —	480
8	Solutions for Review Questions —	481
8.1	Review Questions for Chapter 1 —	481
8.2	Review Questions for Chapter 2 —	481
8.3	Review Questions for Chapter 3 —	482
8.4	Review Questions for Chapter 4 —	482
8.5	Review Questions for Chapter 5 —	483

8.6	Review Questions for Chapter 6 —	483
8.7	Review Questions for Chapter 7 —	484

List of Figures — 487

List of Tables — 495

Index — 499