

Contents

Acknowledgements	vii
Preface	ix
Acronyms	xv
1 Introduction	1
1.1. A New Era of Enterprise Architecture (EA) Planning	1
1.2. What is an Enterprise Architecture?	2
1.3. What is an Enterprise Architecture Framework?	3
1.4. What is EA Planning?	4
1.5. Who is Doing EA Planning Today?	5
1.6. Why Organizations Are Doing EA Planning?	5
1.7. The Zachman Architectural Framework	6
1.8. Multiple Architectural Views	6
1.9. Objectives of this Book	7
1.10. EA Vision and Concept	9
1.11. EA Representation	9
1.12. EA Design Teams and Work Products	10
1.13. EA Measurement	11
1.14. Multiple Criteria	13
1.15. How this Book is Organized	13

2	Motivation and Impetus for Enterprise Architectures: Government, Federal, and Commercial Sectors	21
2.1.	Introduction	21
2.2.	Organization of this Chapter	22
2.3.	Benefits of an Enterprise Architecture	22
2.4.	EA Development in the Federal Agencies	23
2.5.	Clinger-Cohen Act of 1996	24
2.6.	OMB Circular A-130	26
2.7.	Federal Enterprise Architecture Framework (FEAF) of 1999	29
2.8.	US Treasury Enterprise Architecture Framework (TEAF)	29
2.9.	Enterprise Architecture Framework (EAF)	30
2.10.	Technical Architecture Framework for Information Management (TAFIM)	30
2.11.	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) Architecture Framework	33
2.12.	The Open Group's Architectural Framework (TOGAF)	34
2.13.	OMB Reference Models	34
2.14.	Conclusion	35
2.15.	Exercises	36
3	The Business Processes Architectural View	39
3.1.	What is a Business Process?	39
3.2.	How this Chapter is Organized	40
3.3.	Global Airline Services – An Illustrative Example	41
3.4.	Vision and Strategy	44
3.5.	Business Processes	45
3.6.	System Requirements	49
3.7.	Business Process Principles	50
3.8.	Business Process Assumptions	51
3.9.	Business Modeling Toolsets in the Market	52
3.10.	Selection of an EA Toolset	52
3.11.	Conclusions	54
3.12.	Exercises	55

4	The Business Systems Architectural View	59
4.1.	What is a Business System?	59
4.2.	Why Business Systems?	61
4.3.	How this Chapter is Organized	61
4.5.	Business Systems Hierarchical Tree – Example Continued	62
4.6.	Interfaces	64
4.7.	Technical Reference Model (TRM)	69
4.8.	DoD Technical Reference Model	70
4.9.	U.S. Customs Service Technical Reference Model	74
4.10.	Assignment of Business Systems to Projects	75
4.11.	Conclusions	77
4.12.	Exercises	78
5	The Data Architectural View	79
5.1.	Introduction	79
5.2.	What is the Data Architectural View?	80
5.3.	How this Chapter is Organized	82
5.4.	A Methodological Approach to the Data Architectural View	83
5.5.	Data Ownership and Stewardship	103
5.6.	Relationship of the Data Architectural View to the other Architectural Views	103
5.7.	Conclusion	104
5.8.	Exercises	105
6	The Applications Architectural View	107
6.1.	What is a Software Application?	107
6.2.	How this Chapter is Organized	109
6.3.	A Methodology for Construction of the Applications Architectural View	109
6.4.	Alignment of Applications Architectural View	124
6.5.	Software Engineering Standards	124
6.6.	Representation of Software Design	128
6.7.	Conclusion	128
6.8.	Exercises	129

7	The Unified Modeling Language (UML) in Software Design	133
7.1.	Introduction	133
7.2.	How this Chapter is Organized	134
7.3.	Origins of and Ongoing efforts in UML	134
7.4.	Basics of the Unified Modeling Language (UML)	135
7.5.	The Software Life Cycle	136
7.6.	Basics of UML	139
7.7.	An Illustrative Example on the Use of UML	146
7.8.	Conclusions	153
7.9.	Exercises	155
8	The Technology Architectural View	159
8.1.	What is a Technology?	159
8.2.	What is a Technology Architectural View?	160
8.3.	How this Chapter is Organized	161
8.4.	A Methodology for Building the Technology Architectural View	161
	Step 1: Review of Business Systems Hierarchy	164
	Step 2: Review of Applications Architecture	165
	Step 3: Commercially-off-the-Shelf (COTS) Software Strategy	167
	Step 4: Mapping of Applications to Business Systems	172
	Step 5: Technology Principles, Assumptions, and Constraints	172
	Step 6: Identify Candidate Technologies and Platforms	174
	Step 7: Mapping of Technologies to Business Systems	175
	Step 8: Competing Principles of the Technology Architectural View	175
	Step 9: Technology Segmentation and Distribution Model	177
	Step 10: Logical Technology Architecture Design	178
	Step 11: Physical Technology Architecture Design	180

	Step 12: Communicate the Technology Architectural View	181
8.5.	Conclusions	182
9	Distributed Database Design with Multiple Criteria	185
9.1.	Introduction	185
9.2.	Database Segment Development	186
9.3.	How this Chapter is Organized	187
9.4.	Statement of the Problem	187
9.5.	Methodological Approach	189
9.6.	Problem 1: One-to-Many Database Segmentation	190
9.7.	Problem 2: Many-to-One Database Segmentation	195
9.8.	Multiple Criteria	198
9.9.	Conclusions	202
10	Performance and Capacity-Based Architecture Planning: Concepts, Principles, and Measurement Tools	205
10.1.	Introduction	205
10.2.	Objectives of this Chapter	206
10.3.	How this Chapter is organized	207
10.4.	EPCEM Approach to Life Cycle EA Planning	207
10.5.	General EA System Performance Evaluation Approach	212
10.6.	Use of Business Modeling and Performance Simulation Tools	217
10.7.	Measurements and Analysis	220
10.8.	Illustrative Example – What Needs to be Modeled	221
10.9.	Testing and Simulation in a Virtual Lab Environment	225
10.10.	Web Load Generation for Simulation and Performance Analysis	227
10.11.	C&P Measurement Tools	227
10.12.	C&P Roles and Responsibilities	229
10.13.	Conclusions and Recommendations	230

11 Disaster Recovery Planning	233
11.1. Introduction	233
11.2. How this Chapter is Organized	235
11.3. What is Disaster Recovery Planning?	235
11.4. Developing a Disaster Recovery Plan	236
11.5. DR Requirements	237
11.6. Basic Elements of a Contingency Plan	238
11.7. Basics of Intra-Site Data Failover	239
11.8. Basics of Inter-site Failover	240
11.9. RAID Technology for Data Backup	241
11.10. Disaster Readiness	247
11.11. IT Audit Checklist	249
11.12. Cost-Availability Trade-Offs	251
11.13. Global Services Airline, An Example	252
11.14. Conclusions	254
11.15. Exercises	256
12 The Open Group's Architectural Framework (TOGAF)	257
12.1. Introduction	257
12.2. Organization of this Chapter	258
12.3. Technical Architecture Framework for Information Management (TAFIM)	258
12.4. Emergence of TOGAF	259
12.5. Technical Reference Model (TRM)	260
12.6. Standards Information Base (SIB)	260
12.7. Architectural Development Method (ADM)	261
12.8. An Illustrative Example – A Manufacturing Environment	265
12.8.1. Phase A: Initiation and Framework	267
12.8.2. Phase B: Baseline Description	272
12.8.3. Phase C: Target Architecture	275
12.8.4. Phase D: Opportunities and Solutions	275
12.8.5. Phase E: Project Initiation and Migration Planning	280
12.9. Conclusion	284

13	The Department of Defense Architecture Framework (DODAF)	285
13.1.	Introduction	285
13.2.	Organization of this Chapter	286
13.3.	Structure of the DODAF	287
13.4.	Guiding Principles of the DODAF Philosophy	288
13.5.	The Six-Step Architecture Description Process	288
13.6.	A Set of Automated Tools	289
13.7.	Description of the Product Types (i.e., Work Products)	291
13.7.1.	Overview and Summary Information (AV-1)	295
13.7.2.	Integrated Dictionary (AV-2)	295
13.7.3.	High-Level Operational Concept Graphic (OV-1)	296
13.7.4.	Operational Node Connectivity Description (OV-2)	297
13.7.5.	Operational Information Exchange Matrix (OV-3)	298
13.7.6.	Command Relationships Chart (OV-4)	298
13.7.7.	Activity Model (OV-5)	300
13.7.8.	Systems Interface Description (SV-1)	300
13.7.9.	Systems Communications Description (SV-2)	301
13.7.10.	Technical Architecture Profile (TV-1)	303
13.7.11.	Standards Technology Forecast (TV-2)	303
13.8.	Comparison of DODAF with Zachman's Framework	304
13.9.	Comparison of DODAF with the Federal Enterprise Architecture Framework	308
13.10.	Comparison of DODAF with Spewak's Enterprise Architecture Planning	309
13.11.	Conclusions	311
13.12.	Exercises	312
14	Colombia's SENA Enterprise Architecture: A First EA Design and Roadmap	315
14.1.	Introduction	315

14.2.	How this Chapter is Organized	316
14.3.	SENA Background	316
14.4.	Architecture Requirements	317
14.5.	SENA's Organization and EA Stakeholders	318
14.6.	SENA's Proposed Target Arquitectura	318
14.6.1.	The Organizational Architectural View	323
14.6.2.	The Information Architectural View	325
14.6.3.	The Infrastructures Architectural View	326
14.6.4.	The Functional Architectural View (Business Processes and Systems)	329
15	Multiple Criteria for EA Framework Selection and/or Tailoring: Or What is the Best EA Framework for Your Customer?	333
15.1.	Introduction	333
15.2.	How this Chapter is Organized	334
15.3.	Alternate Architectural Frameworks	334
15.3.1.	The Zachman EA Framework	335
15.3.2.	Reference Model for Open Distributed Processing (RM-ODP)	335
15.3.3.	IBM's Architectural Description Standard (ADS)	338
15.3.4.	The Spewak EA Framework	340
15.3.5.	Generalized Enterprise-Reference Architecture and Methodology (GERAM)	342
15.3.6.	The Open Group Architecture Framework (TOGAF)	344
15.3.7.	DoD's C4ISR Architectural Framework (DODAF)	345
15.3.8.	The Cap Gemini Integrated Architecture Framework (IAF)	347
15.3.9.	Federal Enterprise Architecture Framework (FEAF)	349
15.4.	A Definition of a Best Enterprise Architecture	351
15.5.	Categories of EA Knowledge	352
15.6.	EA Selection Methodology	352

15.7.	Conclusions	356
15.8.	Exercises	357
16	Multiple Criteria for Enterprise Architecture (EA)	361
	Evaluation and Assessment	
16.1.	Introduction	361
16.2.	How this Chapter is Organized	361
16.3.	Literature Review	362
16.4.	The Uses and Benefits of EA Indicators & Metrics in the Enterprise	363
16.5.	High-Level Criteria for EA Evaluation	363
16.6.	OMB's EA Reference Models and EA Indicators	365
16.7.	GAO's EA Maturity Model and Findings	369
16.8.	A Proposed Extension of the GAO EA Maturity Model	372
16.9.	Global Market and Technology Drivers of EA Measurement Needs	373
16.10.	An EA Compliance Checklist	374
16.11.	Conclusions	375
17	e-Business, e-Government, e-Commerce, and Digital Administration	377
17.1.	Introduction	377
17.2.	How this Chapter is Organized	378
17.3.	Drivers of e-Something	378
17.4.	The New Technologies of Information and Communication (TICs)	379
17.5.	TIC-Supported Services	380
17.6.	e-Government	381
17.7.	e-Democracy	382
17.8.	A Systems Technology Architecture for e-Commerce	388
17.9.	Who is Paying for the New Technologies	389
18	Lessons Learned in EA Planning, Design, and Development	395
18.1.	Introduction	395

18.2.	How this Chapter is Organized	395
18.3.	EA Lessons Learned	395
18.4.	Conclusions	402
19	EA Implementation, Compliance, and Governance	403
	Strategies: A Road Map to EA Success	
19.1.	Introduction	403
19.2.	How this Chapter is Organized	403
19.3.	Success Factors in Building an EA	404
19.4.	EA Engineering, How to Do it Right	404
19.5.	Organizational Change (OC)	408
19.6.	Institutional EA Governance	409
19.7.	EA Compliance	410
19.8.	Securing Support from your EA Stakeholders Community	410
20	A Mathematical Foundation for Enterprise	415
	Architecture Design	
20.1.	Why a Mathematical Foundation for EA Design?	415
20.2.	How this Chapter is Organized	416
20.3.	EA Mathematical Representation	417
20.4.	Integrated, Multiple Architectural Design Views	427
20.5.	Pareto Efficient Design Frontier	431
	20.5.1. Example in Aircraft Design	431
	20.5.2. Example in Database Design	433
20.6.	Reaching for the EA Pareto Frontier with Multiple Design Teams, New EA Model for Future Research	436
20.7.	Conclusions	440
	Glossary	443
	Bibliography	453
	Appendix	473
	Index	477