

# Supply Chain Risk Management

## Applying Secure Acquisition Principles to Ensure a Trusted Technology Product

Ken Sigler, Dan Shoemaker, and Anne Kohnke



CRC Press

Taylor & Francis Group

Boca Raton London New York

---

CRC Press is an imprint of the  
Taylor & Francis Group, an **informa** business  
AN AUERBACH BOOK

---

# Contents

---

<b>Foreword .....</b>	<b>xi</b>
<b>Preface.....</b>	<b>xiii</b>
<b>Authors.....</b>	<b>xvii</b>
<b>Contributions.....</b>	<b>xix</b>
<b>Chapter Structure and Summary.....</b>	<b>xxi</b>
<b>1 Why Secure Information and Communication Technology</b>	
<b>Product Acquisition Matters .....</b>	<b>1</b>
Introduction to the Book .....	1
Underwriting Trust and Competence .....	2
Justification and Objectives of the Book.....	3
The Five-Part Problem.....	4
Putting Product Assurance into Practice .....	7
The Supply Chain and the Weakest Link.....	8
Visibility and Control .....	9
Building Visibility into the Acquisition Process .....	11
The Seven Phases of ICT Acquisition Practice .....	13
Practice Area One: Procurement Program Initiation and Planning .....	14
Practice Area Two: Product Requirements Communication and Bidding .....	16
Practice Area Three: Source Selection and Contracting.....	16
Practice Area Four: Supplier Considerations.....	20
Practice Area Five: Customer Agreement Monitoring.....	21
Practice Area Six: Product Acceptance.....	22
Practice Area Seven: Project Closure.....	23
Building the Foundation: The Role of Governance in Securing the ICT Supply Chain .....	23
The Use of Standard Models of Best Practice .....	32
Chapter Summary.....	33
Key Concepts.....	38
Key Terms .....	39
References .....	40

<b>2 Building a Standard Acquisition Infrastructure .....</b>	<b>41</b>
ISO/IEC 12207 .....	42
Agreement Processes: Overview.....	45
Acquisition Process.....	47
Acquisition Activity: Acquisition Preparation .....	50
Concept of Need.....	51
Define, Analyze, and Document System Requirements .....	52
Consideration for Acquiring System Requirements .....	53
Preparation and Execution of the Acquisition Plan.....	54
Acceptance Strategy Definition and Documentation .....	55
Prepare Acquisition Requirements.....	56
Acquisition Activity: Acquisition Advertisement .....	57
Acquisition Activity: Supplier Selection .....	58
Acquisition Activity: Contract Agreement.....	59
Acquisition Activity: Agreement Monitoring.....	60
Acquisition Activity: Closure .....	61
Supply Process.....	61
Supply Activity: Opportunity Identification.....	63
Supply Activity: Supplier Tendering .....	63
Supply Activity: Contract Agreement.....	65
Supply Activity: Contract Execution .....	67
Supply Activity: Product/Service Delivery and Support.....	74
Supply Activity: Closure .....	75
Chapter Summary.....	75
Key Terms .....	76
References .....	77
<b>3 The Three Building Blocks for Creating Communities of Trust .....</b>	<b>79</b>
Introduction to Product Trust .....	79
Building a Basis for Trust .....	81
The Hierarchy of Sourced Products .....	82
The Problem with Sourced Products.....	88
Promoting Trust through Best Practice .....	92
Moving the Product up the Supply Chain .....	93
The Standard Approach to Identifying and Controlling Risk.....	95
The Three Standard Supply Chain Roles .....	96
The Acquirer Role .....	97
The Supplier Role .....	101
The Integrator Role.....	104
Information and Communication Technology Product Assurance.....	105
Adopting a Proactive Approach to Risk .....	107
People, the Weakest Link .....	108

Chapter Summary .....	110
Key Concepts.....	114
Key Terms .....	115
References .....	115
<b>4 Risk Management in the Information and Communication Technology (ICT) Product Chain .....</b>	<b>117</b>
Introduction.....	117
Supply Chain Security Control Categorization.....	119
Categorization Success through Collaboration .....	123
Supply Chain Security Control Selection .....	124
The Eight Tasks of Control Selection.....	128
Documentation Prior to Selection.....	128
Select Initial Security Control Baselines and Minimum Assurance Requirements.....	128
Determine Need for Compensating Controls.....	131
Determine Organizational Parameters.....	132
Supplement Security Controls .....	132
Determine Assurance Measures for Minimum Assurance Requirements .....	134
Complete Security Plan .....	135
Develop a Continuous Monitoring Strategy.....	136
Supply Chain Security Control Implementation .....	137
Implement the Security Controls Specified in the Security Plan.....	138
Security Control Documentation .....	141
Supply Chain Security Control Assessment .....	142
The Four Tasks of Security Control Assessment.....	144
Implications of Security Control Authorization to the Supply Chain .....	149
The Four Tasks of Security Control Authorization.....	151
Supply Chain Risk Continuous Monitoring.....	155
The Seven Tasks of Security Continuous Monitoring .....	157
Determine the Security Impact of Changes.....	158
Assess Selected Security Controls .....	159
Conduct Remediation Actions.....	159
Update the Security Plan, Security Assessment Report, and POA&M .....	160
Report the Security Status.....	160
Review the Reported Security Status on an Ongoing Basis.....	161
Implement an ICT System Decommissioning Strategy .....	162
Chapter Summary.....	162
Key Terms .....	164
References .....	165

<b>5 Establishing a Substantive Control Process .....</b>	<b>167</b>
Introduction: Using Formal Models to Build Practical Processes .....	167
Why Formal Models Are Useful .....	169
NIST SP 800-161, Supply Chain Risk Management Practices for Federal Information Systems.....	170
The 21 Principles for SCRM .....	172
Principle 1: Maximize Acquirer’s Visibility into the Actions of Integrators and Suppliers in the Process.....	173
Principle 2: Ensure That the Uses of Individual Supply Chain Components Are Kept Confidential .....	174
Principle 3: Incorporate Conditions for Supply Chain Assurance in Specifications of Requirements .....	175
Principle 4: Select Trustworthy Elements and Components .....	176
Principle 5: Enable a Diverse Supply Chain—Do Not Sole Source .....	176
Principle 6: Identify and Protect Critical Processes and Elements.....	176
Principle 7: Use Defensive Design in Component Development.....	176
Principle 8: Protect the Contextual Supply Chain Environment.....	177
Principle 9: Configure Supply Chain Elements to Limit Access and Exposure.....	177
Principle 10: Formalize Service/Maintenance Agreements .....	177
Principle 11: Test throughout the SDCL.....	178
Principle 12: Manage All Pertinent Versions of the Configuration .....	178
Principle 13: Factor Personnel Considerations into Supply Chain Management.....	179
Principle 14: Promote Awareness, Educate, and Train Personnel on Supply Chain Risk .....	179
Principle 15: Harden Supply Chain Delivery Mechanisms.....	179
Principle 16: Protect/Monitor/Audit the Operational Supply Chain System .....	180
Principle 17: Negotiate and Manage Requirements Changes.....	180
Principle 18: Manage Identified Supply Chain Vulnerabilities.....	181
Principle 19: Reduce Supply Chain Risks during Software Updates and Patches.....	181
Principle 20: Respond to Supply Chain Incidents .....	181
Principle 21: Reduce Supply Chain Risks during Disposal.....	182
Making Control Structures Concrete: FIPS 200 and NIST 800-53(Rev 4) .....	182
Application of FIPS 200 and NIST 800-53(Rev 4) to Control Formulation .....	183
The Generic Security Control Set.....	186

NIST 800-53 Control Baselines.....	186
Detail of Controls .....	187
Six Feasibility Considerations for NIST 800-53 .....	188
NIST 800-53 Catalog of Baseline Controls.....	190
Implementing Management Control Using the Standard	
NIST SP 800-53 Rev. 4 Control Set.....	191
Practical Security Control Architectures .....	192
Control Statements .....	192
Supplemental Guidance .....	193
Control Enhancements .....	193
Real-World Control Formulation and Implementation .....	193
Limitations of the 800-53 Approach in SCRM .....	194
Chapter Summary.....	196
Key Concepts.....	199
Key Terms .....	200
References .....	201
<b>6 Control Sustainment and Operational Assurance.....</b>	<b>203</b>
Sustaining Long-Term Product Trust.....	203
Step 1: Establish and Maintain Situational Awareness .....	205
Step 2: Analyze Reported Vulnerability and Understand	
Operational Impacts .....	209
Environmental Monitoring.....	210
Vulnerability Reporting .....	210
Vulnerability Response Management .....	211
Step 3: Obtain Management Authorization to Remediate .....	212
Understand Impacts.....	213
Communicating with Authorization Decision-Makers.....	215
Step 4: Manage and Oversee the Authorized Response.....	216
Responding to Known Vulnerabilities with Fixes .....	217
Responding to Known Vulnerabilities without Fixes .....	217
Fixing an Identified ICT Supply Chain Vulnerability.....	218
Step 5: Evaluate the Correctness and Effectiveness of the	
Implemented Response .....	219
Step 6: Assure the Integration of the Response into the Larger	
Supply Chain Process.....	223
Establishing a Supply Chain Assurance Infrastructure .....	225
Policies for Operational Assurance: Method, Measurement,	
and Metrics .....	226
Building a Practical Supply Chain Sustainment Function.....	228
Generic Management Roles.....	230
Conducting the Day-to-Day Operational Response Process .....	230

Response Management Process Planning.....	231
Deciding What to Secure .....	232
Enforcing Management Control .....	232
Status Assessment.....	233
Maintaining Documentation Integrity .....	234
Chapter Summary.....	234
Key Concepts.....	237
Key Terms .....	237
References .....	238
<b>7 Building a Capable Supply Chain Operation.....</b>	<b>239</b>
Introduction.....	239
Why a Capability Maturity Model? .....	241
A Staged Model for Increasing Capability in Supply Chain Management .....	242
Level One: The Initial Level .....	244
Level Two: The Repeatable Level .....	244
Level Two: Acquisition Planning.....	246
Level Two: Solicitation.....	247
Level Two: Requirements Development and Management .....	248
Level Two: Project Management .....	249
Level Two: Contract Tracking and Oversight .....	250
Level Two: Evaluation .....	251
Level Two: Transition to Support .....	251
Level Three: The Defined Level .....	253
Level Three: Process Definition and Maintenance .....	254
Level Three: User Requirements.....	256
Level Three: Project Performance Management.....	257
Level Three: Contract Performance Management.....	257
Level Three: Acquisition Risk Management .....	258
Level Three: Training Program Management.....	259
Level Four: The Quantitative Level.....	260
Level Four: Quantitative Process Management.....	260
Level Four: Quantitative Acquisition Management .....	261
Level Five: The Optimizing Level.....	262
Level Five: Continuous Process Improvement .....	262
Level Five: Acquisition Innovation Management.....	263
Practical Evaluation of Supply Chain Process Maturity.....	264
Maturity Rating Schemes .....	266
Chapter Summary.....	267
Key Terms .....	272
References .....	272
<b>Index .....</b>	<b>273</b>