CONTENTS

Preface xv

Why this Book Needed to be Written xvi

Chapter 1 Introduction to Software Quality 1

Quality, as a Management Information System 3
Software Modeling and Commonly Used Models 5
The Structure of the Model 7
Guidebook Design Concepts 8
The Three CPIs 9
Total Quality Management Practice 11
The First Steps to Planning for Quality 12
The Procedure 14
A Case Study 17

Chapter 2 Establishment of a Software Quality Program 21

Scope of the Software Quality Program 24
Professional Ethics 24
A Minimal QA Effort 25
Selling the Quality Plan 25

Chapter 3 The Trillion Dollar Dilemma – The Year 2000 31

Why it is a Problem 32

A Y2K Life-cycle Model 33
Verification and Testing 34
New Equipment/New Systems 34
Lessons 35
Realities 35
The Programmer's Paradigm 36
The Basic Assumptions Behind Development 37
A Paradigm Shift 38
Locating and Reusing Hidden Assets 40
Analysis and Design for Maintenance 41
Implementing and Testing a Maintenance Change 41
Systems Testing 42

Chapter 4 Software Quality Assurance Planning – An Overview 45

History of the Standard 45
Contents and Structure of the Standard 46
Possible Problems with Use of 730 48
Establishing Quality Goals **49**
The Purpose of Quality Goals 49
The Quality Goal Methodology 50
Quality Goals 54
SQA Planning Software Productivity and Documentation – A Case Study **61**

Chapter 5 Software Quality Assurance Plan – Purpose and Scope 65

Document Organization 66

Chapter 6 Software Quality Assurance Plan – Management 67

Organization 68
Quality Tasks 70
Responsibilities 71
A Minimal QA Effort 71
Factors Affecting the SQA Effort 73
The Critical Personnel Question 76
Fundamental Requirements 77
Ways to Kill Quality Assurance 79

Chapter 7 Documentation 81

Software Requirements Specification (SRS) 82
Software Design Description (SDD) 83
Software Interfaces Documentation 83
Software Test Documentation 83
Software Development Plan 84
User Documentation 84
Document Distribution 84

Chapter 8 Standards, Practices, Conventions and Metrics 87

The Control Tower 87
Metrics 88
As to ISO 9000 90
QA Techniques 91
Planning for Process Improvement 94

Chapter 9 Reviews and Audits 97

Overview of Software Project Reviews 97
Procedural Description Template 98
Action Items 99
CMM Compatibility 100
ISO 9000 Compatibility 104
The Management Review Process 105
Objectives 105
Management Review Inputs 105
Entry Criteria 105
Management Review Procedures 106
Review Process Prerequisites 107
Audit Process Prerequisites 107
The Technical Review Process 109
Technical Review Objectives 109
Special Responsibilities 109
Technical Review Input 109
Entry Criteria 110
Procedure 110
Exit Criteria 110
Technical Review Output 111
Auditability 111
Software Requirements Review 111
Preliminary Design Review 112
Critical Design Review 113
Preliminary Test Review 114

Critical Test Review 115
ATR: Acceptance Test Review 115
The Software Inspection Process 117
Software Inspection Objective 117
Special Responsibilities 117
Software Inspection Input 118
Entry Criteria 118
Software Inspection Procedures 118
Software Inspection Exit Criteria 120
Software Inspection Output 120
Software Inspection Auditability 120
Data Collection Requirements 121
The Walkthrough Process 122
Walkthrough Objective 122
Special Responsibilities 122
Walkthrough Input 122
Entry Criteria 123
Walkthrough Procedures 123
Walkthrough Output 124
Auditability 124
The Audit Process 125
Audit Objective 125
Audit Input 125
Entry Criteria 125
Audit Procedures 126
Audit Exit Criteria 127
Audit Output 127
Auditability 128
Document Verification 129
Introduction to Verification and Validation 129
The Verification and Validation Technique 129
The Point 131
Document Audit and Verification 132
A Case Study 132

Chapter 10 Test 133

The Processes of Software Testing 133
ISO 9000 Compatibility 136
CMM Compatibility 138
Software Testing Taxonomy 139
Anomalies 140
Category and Priority Classifications for Problem Reporting 141
Testing Organization 141
Pass/Fail Criteria 142

Requirement Labels 142
Recovery 142
Unit Testing Background 143
Unit Test Planning Activities 144
Test Set Acquisition Activities 145
Measurement Activities 145
Integration Testing – Background 146
System Testing – Background 147
Qualification Testing – Background 147
Acceptance Testing – Background 148
Software Test Description for the Lion Subsystem[3] 149

Chapter 11 Problem Reporting and Corrective Action 161

Requesting a Change 162
Change Costs 162
The CCB 164
CMM Compatibility 165
ISO 9000 Compatibility 166
Problem Reporting 167
Problem Discovering 167
Writing and Verifying the Software Problem Report 168
Corrective Action 170

Chapter 12 Tools, Techniques and Methodologies 175

Software Tools 176
Hardware Tools 176
Techniques 176
Methodologies 176
CMM Compatibility 177
ISO 9000 Compatibility 178

Chapter 13 Code Control 179

Emphasis vs De-emphasis 180
Version Control 182
Archiving 182
Nondeliverable Code 183
CMM Compatibility 183
ISO 9000 Compatibility 184

Chapter 14 Media Control 185

Backup Procedures 186
Document Modules 186
Media Distribution 188
CMM Compatibility 189
ISO 9000 Compatibility 189

Chapter 15 Supplier Control 191

Contractor Plans 193
Contractor Quality Evaluation 193
Requirements Assurance 194
Previously Developed Software 194
CMM Compatibility 195
ISO 9000 Compatibility 195
Purchasing Quality Control Methods 197
Effective Use of Inspection Services 199
The Purchase Order 199

Chapter 16 Records Collection, Maintenance, and Retention 201

The Six Axioms of Quality Management 205
Quality Evaluation Records 206
Collecting Quality Data 207
Preparation and Recording of Quality Data 207
Maintenance of Data Relating to Quality 208
Quality Evaluation Reports 209
Software Quality Report Types and Distribution 209
Software Quality Metrics Analysis 210
Development Error Data 213
Reliability 220
Confidence Level 221
Software Quality Metric 221
CMM Compatibility 222
ISO 9000 Compatibility 222

Chapter 17 Training 225

CMM Compatibility 227
ISO 9000 Compatibility 227

Chapter 18 Risk Management 229

Risk Assessment 230
Fault Tree Analysis 231
Risk Management Breakdown 232

Hazard Identification and Categories 232
Hazard Identification Procedure 234
The Feedback Mechanism 235
Risk Evaluation 235
Risk Dangers 236
Risk Probabilities 236
Significance 237
Reporting 237
Risk Management 238
CMM Compatibility 238
ISO 9000 Compatibility 239

Chapter 19 Comparison of the ISO 9000 Model with SEI's CMM 241

The Models' Orientations 243
ISO 9000 Weaknesses 244
CMM Weaknesses 247
The Capability Model Enjoys Some Important Strengths 249
SPICE – Software Process Improvement and Capability Determination 249

Appendices 253

Appendix I – Software Quality Program Evaluation 253
Appendix II – Ready-to-use Forms 263
Appendix III – A Template for Software Quality Program Plans 272
Appendix IV – Subcontractor Quality Auditing 275
Appendix V – Testing Taxonomy 282

Glossary 287

Acronyms 295

References 299

Standards 299
Articles from Professional Journals 306
Books of Note for the Reader of this Guidebook 310
International Standards 312
Alternate Software Quality Assurance Plans 314

Index 315