

Management for Professionals

Philip Bauer

A Comprehensive Project Management Guide

Quality Management, Integrated
Six-Sigma and Change Management
Compilation

 Springer

Management for Professionals

The Springer series “Management for Professionals” comprises high-level business and management books for executives, MBA students, and practice-oriented business researchers. The topics cover all themes relevant to businesses and the business ecosystem. The authors are experienced business professionals and renowned professors who combine scientific backgrounds, best practices, and entrepreneurial vision to provide powerful insights into achieving business excellence.

The Series is SCOPUS-indexed.

Philip Bauer

A Comprehensive Project Management Guide

Quality Management, Integrated
Six-Sigma and Change Management
Compilation

 Springer

Philip Bauer
Six Sigma Management Academy
Köln, Nordrhein-Westfalen, Germany

ISSN 2192-8096 ISSN 2192-810X (electronic)
Management for Professionals
ISBN 978-3-031-68251-3 ISBN 978-3-031-68252-0 (eBook)
<https://doi.org/10.1007/978-3-031-68252-0>

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG 2024

This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

If disposing of this product, please recycle the paper.

Preamble

The **Project Management Compilation** is based on the IPMA® competence baseline (ICB) version 3.0, which itself is also heavily related to the project management standards: PMBOK Guide (official ANSI Norm) and DIN. Purpose of this workbook is to provide supporting self-study material to complement the daily project management needs. It offers:

- A reliable basis for theoretical and practical work
- A reference and a comprehensive overview of the current state of development of project management and adjacent disciplines
- A tailored working basis for master's studies on “project management”
- A compilation of knowledge from experienced industry experts from around the world

Innovative problem-solving in interdisciplinary project groups is an essential characteristic of successful, flexible companies. The field of possible assignments can be very broad, ranging from a short-term solution of an economic organizational problem to the implementation of long-term, complex investment projects.

Project management is a cross-disciplinary method and is now the standard—for the planning and control purposes. The individual techniques and tools are not the key elements, but rather the focus on the successful resolution of the project task. The use of appropriate computer applications also belongs to the tools of the project manager, as well as modern methods of project and process control.

This and several other aspects—including an in-depth look at the Six Sigma philosophy of project management with practical examples for the industry—are covered in this workbook.

Contents

1	Project, Project Management, and PM Process	1
1.1	Project and Project Management	1
1.2	Definition of Project.	2
1.3	Definition of Project Management.	3
1.4	Project Management Processes	5
1.5	Process Model DIN 69901.	8
1.6	Project Type	16
	Reference	19
2	Project Management Success	21
2.1	What Is Project Success.	23
2.2	What Is Project Management Success	25
3	Project Requirements and Objectives	27
3.1	SMART Objectives	30
3.2	Milestones and Functional Target Setting	34
4	Risks and Opportunities	39
4.1	The Purpose of Risk Management.	40
4.2	The Results of Risk Management	41
4.3	The Process of Risk Management	42
4.4	Risk Management Planning.	43
4.5	Identify Risk Conditions	43
4.6	Risk Analysis and Evaluation	44
4.7	Evaluating Program Impact	46
4.8	Risk Response Planning and Implementation	49
4.9	Risk Monitoring and Control.	51
4.10	An Illustration of a Risk Management Process	52
4.11	Risk Identification	53
4.12	Risk Assessment.	54
4.13	Risk Response Planning.	59
4.14	Alignment	62
4.15	Projects Within a Program	62
	References.	63

5	Quality	65
5.1	Terms and Definitions	67
5.2	Quality Function Deployment (QFD)	71
5.3	History of QFD	72
5.4	QFD Methodology	72
5.5	HOQ Evaluation	75
5.6	Kano Model	77
5.7	Implementation of QM Tools	81
5.8	Fitting Six Sigma into Process Management	85
5.9	QM Toolbox Usage	87
5.10	The Process Map	90
5.11	Cascading $Y = f(x)$	93
5.12	Cause-and-Effect Diagram (Ishikawa)	94
5.13	The Cause-and-Effect Matrix (X-Y Matrix)	96
5.14	Failure Mode and Effects Analysis (FMEA)	97
5.15	The Project Charter	99
5.16	Measurement System Analysis	100
5.17	The Histogram	101
5.18	The Pareto Analysis	102
5.19	The Box Plot	103
5.20	The Run Chart	104
5.21	Six Sigma as a Symbol, Level, and Measure	105
5.22	Quality Management as Part of the Project Planning	106
5.23	Quality Planning	106
5.24	Quality Control	107
5.25	Quality Assurance	107
5.26	Quality Improvement/Experience Backup	108
	References	108
6	Project Organization	109
6.1	Participating in a Project	110
6.2	The Steering Committee	113
6.3	The Advisory Committee	115
6.4	Project Team Members	116
6.5	The Project Leader	119
6.6	Types of Project Organization	121
6.7	Staff Unit Organization (Programmatic Based)	121
6.8	The Matrix Organization	123
6.9	The Autonomous Project Organization	126
6.10	Choosing a Suitable Type of Organization	129
7	Teamwork	131
7.1	Introduction	131
7.2	Basics and Definition	132
7.3	Ability to Work in a Team	133
7.4	Optimize Team Meetings	133

7.5	Make Time for Team Members	134
7.6	Surface and Manage Emotional Issues	134
7.7	Celebrate Success.	135
7.8	Principles of Team Leadership and Facilitation.	136
7.9	Selecting a Facilitator	137
7.10	Facilitating the Group Task Process.	138
7.11	Facilitating the Group Maintenance Process	139
7.12	Stages in Group Development	139
7.13	Phase Model by Tuckman	139
7.14	Member Roles and Responsibilities.	141
7.15	Counterproductive Group Roles	142
7.16	Conflict Resolution	143
7.17	Management Role	144
	References.	144
8	Problem Resolution.	145
8.1	Key Takeaways.	146
	References.	147
9	Project Structures	149
9.1	Fundamental Principles and Structures	150
9.2	Work Breakdown Structure Set-Up	155
9.3	Principles of Project Structuring	157
9.4	Work Package Construction.	158
9.5	Key Takeaways.	160
	References.	161
10	Scope and Deliverables.	163
10.1	The Customer (VOC).	163
10.2	Systems and Subsystems	164
10.3	The Project Charter	166
10.4	Strategies for Defining the Project Scope	168
10.5	Bottleneck Subsystems	168
10.6	Go-No-Go Decisions	168
10.7	Methods for Scoping	170
	Reference	170
11	Project Phases	171
11.1	Project Management and Project Phases	173
11.2	Milestones and Gateways.	174
11.3	Phase Plan	176
11.4	Process Models	177
11.5	The Process Model of System Engineering	178
11.6	Process Model for Handling Organizational Projects	180
	References.	182

12	Agile Project Management	183
12.1	Agile Project Management Using the Example of Serum.	184
12.2	Agile Manifesto	186
12.3	Core Features	186
12.4	Agile Development	187
12.5	Agile Project Management	187
	Agile Projekt Management Process.	188
	Reference	189
13	Scheduling	191
13.1	Project Planning Transfer from Schedule Planning into Phase Planning	191
13.2	Define Technological Node Sequence	193
13.3	Transfer Work Breakdown Structure into the Schedule Plan.	194
13.4	Determination of Resource Needs and Resource Balancing	194
13.5	Process and Schedule Plan Optimization.	195
13.6	Release of Execution Plan	195
13.7	Basics of Gantt and Network Diagram Technology	196
13.8	Precedence Diagram Method (PDM).	198
13.9	Types of Dependencies	199
13.10	Specify Predecessors and Successors Given a List of Project Activities	201
13.11	Arrange Project Activities in Order of Execution to Create a Precedence Diagram	202
13.12	Node Standard Related to DIN 69900	203
13.13	Forward and Backward Time Calculation	204
13.14	Critical Path Method: Examples Using the Precedence Diagram	208
13.15	Tools Used to Create a Precedence Diagram.	210
	References.	211
14	Resources	213
14.1	Resource Management.	213
14.2	Between Offer and Demand.	214
14.3	The Three Main Dimensions What, Who, When.	215
14.4	Resource Loading and Resource Levelling	216
14.5	Juggling Your Resources with Resource Levelling	216
14.6	Two Main Types of Resource Levelling	217
14.7	Estimate Processing Effort.	217
14.8	Capacity Planning	219
	References.	222
15	Cost and Finance	223
15.1	Estimating Costs	224
15.2	Analogous Estimate	224
15.3	Parametric Estimate	225
15.4	Estimating Costs to Initiate Projects	226

15.5	Vendor Bid Analysis	226
15.6	Bottom-Up Estimating	227
15.7	Establishing a Budget	230
15.8	Budget Timeline	230
15.9	Managing Cash Flow	231
15.10	Contingency Reserves	231
15.11	Management Reserves	232
15.12	Evaluating the Budget During the Project	232
15.13	Earned Value Analysis	232
15.14	Schedule Variance	235
15.15	Variance Indexes for Schedule and Cost	235
15.16	Estimated Cost To Complete The Project	237
15.17	Estimate Final Project Cost	237
15.18	Key Takeaways	239
	References	239
16	Procurement	241
16.1	Project Procurement	241
16.2	Procurement Plan	241
16.3	Selecting the Contract Approach	242
16.4	Soliciting Bids	242
16.5	Qualifying Bidders	242
16.6	Request for Quote	243
16.7	Request for Proposal	243
16.8	Evaluating Bids	243
16.9	Awarding the Contract	244
16.10	Planning Session Follows Contract Award	244
16.11	Managing the Contracts	244
16.12	Logistics and Expediting	245
16.13	Key Takeaways	246
	References	246
17	Contracts	247
	References	248
18	Contractual Law in Projects	249
	References	249
19	Organization and Change Management	251
19.1	What Is Change Management?	252
19.2	Application of Strategies	256
19.3	Application of Culture	256
19.4	Culture: Identifying Unwritten Rules	257
19.5	Vision and Mission Statement	257
19.6	Application Area Organization	258
19.7	Application Area Technologies	259
	Summary	259
	Changes	259

19.8	Types of Resistance	260
19.9	Methods to the Overcoming of the Resistance	261
	There Is No Change Without Resistance.	261
19.10	Building Relationships.	263
19.11	Concept of Organizational Changes	264
19.12	Organization Design	264
19.13	How to Change Management Through Organizational Design	265
19.14	Force Field Analysis	266
19.15	Organizational Development: Lewin Model	269
19.16	Change Management and Company Culture	271
19.17	The Learning Organization as a Model for the Future.	273
19.18	Value Component of the Knowledge Assets of a Learning Organization.	274
19.19	The Learning Organization	275
	References.	279
20	Claim Management.	281
20.1	Term Definition Claim	282
20.2	Claim Management	282
20.3	Claim Management Strategies	282
20.4	Difference Between Claim and Change.	283
20.5	Objectives in Claim Management	284
20.6	Addressees and Triggers in Claim Management	284
20.7	Claim Contracts	285
20.8	Offensive and Defensive Claim Management	286
20.9	Four-Step Success Claim Process	287
20.10	Claim Prevention	288
20.11	Claim Management Tips	291
20.12	Claim Manager Role	292
20.13	Establish Project Performance Data.	294
20.14	Check Claim Schedules and Costs.	295
20.15	Well, Prepared for the Claim Negotiations!.	298
20.16	Factors that Drive Contractual Claims.	299
20.17	EPC: Engineering Procurement Construction	300
	References.	302
21	Project Controlling: Control and Reports	303
21.1	Fundamentals of Project Control	304
21.2	Sub-processes Monitoring and Control	305
21.3	Establish Project Performance Data.	306
21.4	Content of the Control	307
21.5	Control Metrics and Timings	307
21.6	Check Schedules and Costs	307
21.7	Control of the Quality Performance.	309
21.8	The Project Status	310

21.9	Control of Projects	310
21.10	Milestone Trend Analysis (MTA)	312
21.11	Earned-Value Analysis	314
	References.	317
22	Information and Documentation	319
	References.	320
23	Communication	321
	References.	321
24	Project Start.	323
24.1	Model For the Start Process	323
24.2	Project Selection	324
24.3	Goals and Objectives	324
24.4	Internal Rate of Return.	327
24.5	Project Champions and Opponents	328
24.6	Project Scope Start-up	329
24.7	Uses of a Scope Document	329
24.8	Deviation Versus Change.	330
24.9	Project Start-Up	331
24.10	Enhance Alignment Meetings	332
24.11	Project Purpose	333
24.12	Goals	334
24.13	Clarity of Objectives Saves Money	334
24.14	Roles	334
24.15	Trust	335
24.16	Key Takeaways.	336
	References.	337
25	Projects Close-out	339
25.1	Closing Out Contracts	339
25.2	Punch Lists and Performance Tests	339
25.3	Transfer to Customer or Sponsor.	340
25.4	Final Payments.	340
25.5	Post-project Evaluations	340
25.6	Project Profile.	341
25.7	Trust and Alignment Effectiveness	341
25.8	Schedule and Budget Management	341
25.9	Risk Mitigation	342
25.10	Procurement Contracts.	342
25.11	Customer Satisfaction	342
25.12	Senior Management	343
25.13	Document Archival	343
25.14	Project Celebration.	343
25.15	Key Takeaways.	344
	References.	344

26	Questioner	345
26.1	Questions on Project, Project Management, and PM Process	345
26.2	Questions on Project Requirements and Objectives	345
26.3	Questions on Risks and Opportunities	346
26.4	Questions on Quality	346
26.5	Questions on Project Organization	347
26.6	Questions on Teamwork	347
26.7	Questions on Project Structures	348
26.8	Questions on Project Scope and Deliverables	348
26.9	Questions on Project Phases	349
26.10	Questions on Agile Project Management	349
26.11	Questions on Scheduling	349
26.12	Questions on Resources	350
26.13	Questions on Cost and Finance	350
26.14	Questions on Procurement	351
26.15	Questions on Contracts	351
26.16	Questions on Contractual Law in Projects	352
26.17	Questions on Organization and Change Management	352
26.18	Questions on Claim Management	353
26.19	Questions on Project Controlling: Control and Reports	353
26.20	Questions on Communication	354
26.21	Questions on Project Start	354
26.22	Questions on Project Close-out	355
	Reference	355
Index		357

List of Abbreviations

ETC	Estimated time to completion
AC	Actual cost
ACWP	Actual cost of work performed
ANSI	American National Standards Institute ⁶
APM	Agile project management
BAC	Budget at Completion
BCWP	Budgeted cost of work performed
BCWS	Cost of work scheduled
BIC	Best-in-class
BOM	Bill of material
CEO	Chief executive officer
CPI	Cost performance index
CPM	Critical path method
CTQ	Critical to quality
CTS	Critical to satisfaction
CV	Cost variance
D	Duration
DCOV	Define, characterize, optimize, verify
DFMEA	Design failure mode and effects analysis
DFSS	Design for Six Sigma
DIN	Deutsche Institut für Normung e. V.
DMAIC	Define, measure, analyse, improve, and control
DPCI	Rating
EAC	Estimate at completion
EET	Earliest end time
EPC	Engineering procurement construction
EQ	Emotional quotient
EST	Earliest start time
ETC	Estimate to complete
ETC	Estimated total cost
EV	Earned value
EVA	Earned value analysis
EVM	Earned value management
FB	Float buffer

FBB	Free float buffer
FEED	Front-end engineering design
FMEA	Failure mode and effects analysis
FPDS	Ford Production Development System
GPD	Global production system
HOAI	Honorarordnung für Architekten und Ingenieure
HOQ	House of Quality
IB	Independent buffer
ICB	International Competence Baseline
IPMA	International Project Management Association
IRR	Internal rate of return
ISO	International Organization for Standardization
IT	Information technology
JIT	Just in time
KAIZEN	Change for better
KANBAN	Signboard
KIV	Key input variables
KLT	Key life tests
KOV	Key output variable
KPIV	Key process input variable
LET	Latest end time
LST	Latest start time
MSA	Measurement system analysis
MTA	Milestone trend analysis
NASA	National Aeronautics and Space Administration.
NIST	National Institute of Standards
PDM	Precedence diagram method
PERT	Project (or program) evaluation and review technique
PFMEA	Process failure mode and effects analysis
PM	Project management
PMBOK	Project Management Body of Knowledge
PMO	Project management office
POC	Point of closure
PRINCE2	Projects IN Controlled Environments
PV	Planned value
Q1	First quarter
Q3	Third quarter
QFD	Quality functional deployment
QM	Quality management
R	Responsible
R&R	Repeatability and reproducibility
RFP	Request for proposal
RFQ	Request for quote
SAC	Schedule at completion
SCRUM	Scrummage

Serum	Crowd
SMART	Specific, measurable, achievable, relevant, and time-bound
SPI	Schedule performance index
SV	Schedule variance
TFB	Total float buffer
TOC	Theory of constraints
TQM	Total quality management
V. Nr	Node number
VAC	Variance of completion
V-Modell XT	Extreme tailoring
VOC	Voice of the customer
WBS	Work breakdown structure
WP	Work package

List of Figures

Fig. 1.1	Project management components	5
Fig. 1.2	Process House DIN 69901:2009	6
Fig. 1.3	Steps and phases of projects	8
Fig. 1.4	PM phases according to DIN 69901: 2009	9
Fig. 1.5	PM process model according to DIN 69901: 2009	9
Fig. 1.6	PM process initialize according to DIN 69901: 2009	10
Fig. 1.7	PM process definition according to DIN 69901: 2009	11
Fig. 1.8	PM process plan according to DIN 69901: 2009	13
Fig. 1.9	PM process control according to DIN 69901: 2009	14
Fig. 1.10	PM process closure according to DIN 69901: 2009	14
Fig. 2.1	Magical triangle	24
Fig. 3.1	Objective setting content	29
Fig. 3.2	SMART objectives; criteria for an effective goal setting	30
Fig. 3.3	Industry example of SMART objectives	32
Fig. 3.4	Functional and reliability targets for a car over lifetime	36
Fig. 4.1	Workflow structured risk management	42
Fig. 4.2	Example of the relationships of severity and of risk impact upon program dimensions	47
Fig. 4.3	“Identify, evaluate, and plan” for risk	52
Fig. 4.4	Example—Charting the risk assessment	60
Fig. 5.1	Deming’s quality circle	67
Fig. 5.2	Structure of a process-oriented QM-System according to ISO 9000:2000	69
Fig. 5.3	QFD house of quality	70
Fig. 5.4	Quality functional deployment	75
Fig. 5.5	Example-QFD rear-view mirror	76
Fig. 5.6	Kano model	79
Fig. 5.7	Kano model example automotive interior customer satisfaction	80
Fig. 5.8	DMAIC cycle	82
Fig. 5.9	High-level process map	91
Fig. 5.10	Y/X diagram	93
Fig. 5.11	Ishikawa diagram	94
Fig. 5.12	Ishikawa diagram example	96

Fig. 5.13	Failure mode and effects analysis (FMEA)	98
Fig. 5.14	Project charter	99
Fig. 5.15	Histogram.	101
Fig. 5.16	Pareto diagram	102
Fig. 5.17	Box plot diagram	103
Fig. 5.18	Run chart	104
Fig. 5.19	Gauss Bell curve and related Six Sigma	106
Fig. 5.20	Quality management work-tasks-breakdown.	107
Fig. 6.1	Project resources	112
Fig. 6.2	Staff unit organization	122
Fig. 6.3	Matrix organization	124
Fig. 6.4	Matrix organization with PMO	125
Fig. 6.5	Autonomous project organization	127
Fig. 7.1	Tuckman’s model: Team development and performance development.	140
Fig. 7.2	Tuckman’s model: Team performance cycle	141
Fig. 9.1	Main dimensions of projects as a triangle	151
Fig. 9.2	Aspects of structuring	152
Fig. 9.3	Matrix with various classes of aspects.	153
Fig. 9.4	Classification of the work packages.	154
Fig. 9.5	Work breakdown structure according to DIN	155
Fig. 9.6	Build of a work breakdown structure.	157
Fig. 9.7	Object-oriented classification.	158
Fig. 9.8	Functional-oriented classification	158
Fig. 9.9	Work package template/example	160
Fig. 10.1	Example of subsystems inside a system	165
Fig. 10.2	Lemonade stand system with two subsystems.	166
Fig. 10.3	Possible issues addressed by a project charter.	167
Fig. 10.4	Lemonade stand subsystems and strategy	169
Fig. 11.1	Phase model automotive product development	175
Fig. 11.2	Phase plan example	176
Fig. 11.3	Progressive alternative composition and rejection.	179
Fig. 11.4	Stages and phases of an organizational project	181
Fig. 12.1	Course of serum projects	184
Fig. 12.2	Feature burndown chart	185
Fig. 12.3	Agile project management process	188
Fig. 13.1	From the project structure plan into the schedule plan	192
Fig. 13.2	Example Gantt chart	197
Fig. 13.3	Project network diagram	198
Fig. 13.4	Node dependencies: finish–start	199
Fig. 13.5	Node dependencies: start–start	199
Fig. 13.6	Node dependencies: finish–finish	200
Fig. 13.7	Node dependencies: start–finish	200
Fig. 13.8	Simple project network diagram	200
Fig. 13.9	Project network diagram (Build Shed)	203
Fig. 13.10	Node standard related to DIN 69900	204

Fig. 13.11	Example forward calculation (Build Shed)	205
Fig. 13.12	Example backward calculation (Build Shed).	206
Fig. 13.13	Example buffer calculation (Build Shed).	207
Fig. 13.14	Project network diagram (Build Shed) with critical path	208
Fig. 14.1	Resource planning—offer and demand	214
Fig. 14.2	Uneven balanced capacity load (EST) (build shed).	220
Fig. 14.3	Uneven balanced capacity load (EET) (build shed).	221
Fig. 14.4	Balanced capacity load (build shed)	222
Fig. 15.1	Fund transfers and expenditures	230
Fig. 15.2	Schedule variance and cost variance on day six of the shed build.	236
Fig. 19.1	Drivers for changes in the companies	253
Fig. 19.2	Larry E. Greiner’s five growth phases	254
Fig. 19.3	Areas of change management	255
Fig. 19.4	Vision statement.	257
Fig. 19.5	Organizational gap.	258
Fig. 19.6	Resistance classification.	260
Fig. 19.7	The fisher transition curve	261
Fig. 19.8	Motivate and influence—your motivation	263
Fig. 19.9	Organizational design	265
Fig. 19.10	Organizational change management	266
Fig. 19.11	Force field analysis	267
Fig. 19.12	Lewin model graph	269
Fig. 19.13	Spot strategies	270
Fig. 19.14	Iceberg layer.	271
Fig. 19.15	Knowledge assets of a learning organization.	274
Fig. 19.16	Model of integrative knowledge management.	275
Fig. 20.1	Difference between claim and change	283
Fig. 20.2	Organizational chart example of different types of claim contracts.	285
Fig. 20.3	Claim management project controlling circle	293
Fig. 20.4	Gantt chart	295
Fig. 20.5	Earned value analysis (EVA)	296
Fig. 20.6	Milestone trend analysis	297
Fig. 20.7	Claim report example.	298
Fig. 20.8	Key factors that drive claims	299
Fig. 20.9	EPRC scheme.	301
Fig. 21.1	Integrative tasks of project controlling—in individual projects.	304
Fig. 21.2	Three sub-process of project management	306
Fig. 21.3	Schedule deviation in Gantt chart	309
Fig. 21.4	Milestone trend analysis (MTA) example	313
Fig. 21.5	Earned value analysis diagram.	315
Fig. 24.1	Project phase start mode	323
Fig. 24.2	Relationships between mission, goals, and objectives.	325