



PROJECT RISK MANAGEMENT PROFESSIONAL

CERTIFICATION STUDY GUIDE

FIRST EDITION

SAMPLE

PRMP

A PRODUCT OF AAACE INTERNATIONAL

Project Risk Management Professional (PRMP) Certification Study Guide

First Edition

David A. Norfleet, CCP, SECC, DRMP, FAACE, and
Diego Nicolas Quevedo, P.Eng., Editors

2022

Project Risk Management Professional (PRMP) Certification Study Guide

First Edition

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2022-04-01

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First Edition

**David A. Norfleet, CCP CFCC DRMP FAACE, and
Diego Nicolás Guevara, P.Eng., Editors**

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Acknowledgments

The 2020-2021 AACE International Education Board is grateful to all the individuals who have assisted in the development of this study guide. In particular, to the initial Decision and Risk Management Professional (DRMP) Task Force who set the PRMP stage and allowed much of its previous work to be adapted into the PRMP certification. Finally, a special acknowledgement to the 37 PRMP beta examinees who provided valuable feedback and input into the first edition following the successful introduction to the PMRP in its initial beta form.

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PREFACE

AACE International developed the *Project Risk Management Professional (PRMP) Certification Study Guide* for two reasons. First, to aid professionals studying for the AACE International Certification Institute's specialty certification in project risk management (PRM). Second, to assemble and summarize various topics considered essential for PRMP knowledge, as outlined in the current edition of *Recommended Practice 11R-88, Required Skills and Knowledge of Cost Engineering*.

This study guide serves the needs of PRM professionals who are preparing to take the AACE International Certification Institute's PRMP certification examination. It is organized in a concise and easy-to-follow format and is intended to cover the major skills and knowledge used by a PRM professional.

The candidate should use this study guide in conjunction with *RP 11R-88, the TCM Framework, 2nd edition*, and other references identified herein. More specifically, this study guide covers the topics identified in the accompanying *Recommended Practice 121R-21, Required Skills and Knowledge of Project Risk Management*. Together, these publications provide candidates with the knowledge base expected of a cost engineering and risk management professional.

This study guide has two primary objectives:

1. To provide a summary of specific knowledge and competency areas and the associated key terms that a PRMP should comprehend, at a minimum, when preparing for the PRMP certification exam.
2. To provide sample problems and questions for each topic area, as well as the associated answers, to exercise the candidate's understanding of risk management concepts and supporting skills.

To further assist in preparation, the candidate should visit the AACE International website at www.aacei.org for updates to the PRMP certification as well as related recommended practices.

Candidates should begin their examination preparation by first studying the material presented in *RP 11R-88* since risk management professionals must have a comprehensive understanding of the broader aspects within the industry and not just specific risk management topics. The summary and key terms found in each chapter of the study guide and in the Appendix A glossary, coupled with *RP 121R-21*, offer a checklist of the comprehensive knowledge and competencies needed to prepare for the examination.

The candidate should decide how much review time is necessary before working on the sample problems and questions in the study guide. Candidates may have to go back and forth between the referenced publications to gain a full understanding of the subject matter as they attempt the exercise problems and questions. Please note that the actual certification examination questions are likely to address skills and knowledge from multiple sources; therefore, a thorough understanding of the material is vitally important. In addition, the study guide includes several key appendices such as: (1) Project Risk

Management (PRM) Terms and Glossary of Special Interest to Risk Management Professionals, (2) Example of a Risk Management Plan Table of Contents, and (3) an example of a RASCI Matrix.

The eligibility requirements for a PRMP candidate are consistent with the other AACE International Certification Institute's professional certifications and do not require a certain amount of risk management experience. Such specific and focused risk management experience (minimum of four years) applies only to the expert level DRMP certification. However, the amount of examination study and preparation time is proportionally correlated with the candidate's actual risk management experience. Each PRMP candidate must be prepared to spend the necessary amount of study time relevant to his/her experience level and understanding of risk management and its supporting skills and knowledge.

In the candidate's analysis, it is not simply a calculation of years of experience but more so the diversity-base of that experience. The materials found in this study guide can significantly assist the candidate towards assessing gaps in their experience across the key areas of risk management.

Most terms and phrases incorporated in the study guide are generic to the profession; where applicable, however, professionals should understand the definitions provided in the latest version of *Recommended Practice 10S-90, Cost Engineering Terminology* and the terms found in the glossary (Appendix A) of this study guide. The terms and phrases used in industry and applicable risk management software may not conform to the candidate's understanding, so consult the PRMP glossary found in Appendix A in case of a conflict.

It is worthy to note that this study guide is not an academic textbook and is not designed to fully prepare every candidate for the PRMP examination. It is merely a guidance document and intended to introduce the requisite topics, with some expanded explanations for selected topics.

Finally, the goal of the AACE International Education Board is to continually improve this publication, making it a living document that will be revised as needed to support the PRMP exam, while maintaining its strengths. AACE's Education Board encourages everyone to offer comments and suggestions for improvements to future editions; please forward comments to the AACE International Education Board at education@aacei.org.

INTRODUCTION TO THE PRMP CERTIFICATION STUDY GUIDE

This is a study guide for the AACE International Certification Institute’s PRMP certification examination.

This study guide follows a systematic approach in its development:

1. It provides project risk management terminology, ensuring usage that is consistent with *AACE International Recommended Practice 10S-90, Cost Engineering Terminology*.
2. It ensures consistency with AACE International’s *Total Cost Management (TCM) Framework*, (particularly Sections 7-10) as summarized in Figure 1.
3. It ensures consistency with AACE International’s *Skills and Knowledge of Cost Engineering*. And,
4. It follows AACE International’s recommended practices related to PRM review and process wherein, specifically the focus is on the required skills and knowledge of project risk management as covered in *RP 121R-21*.

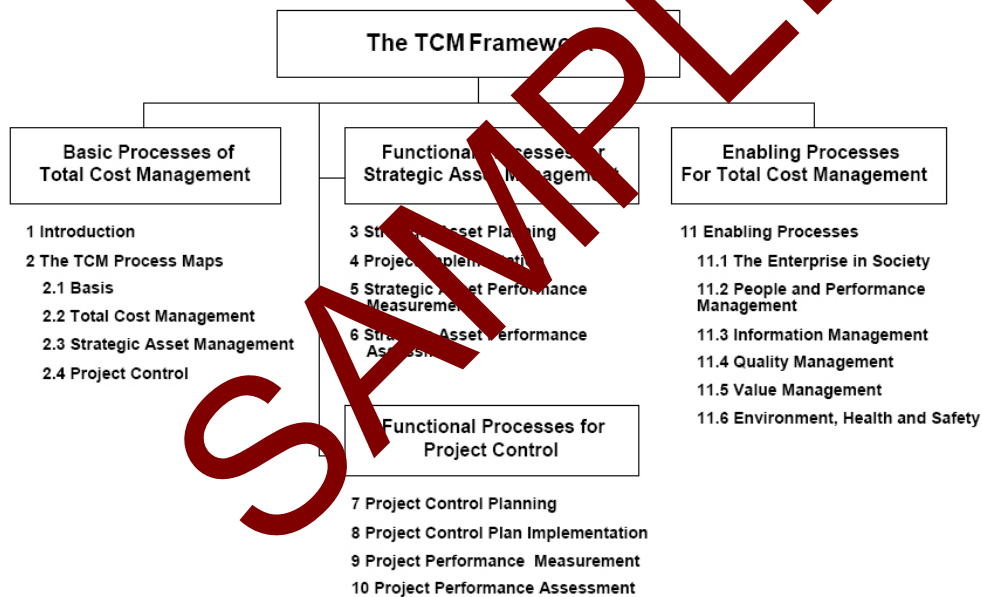


Figure 1—The Outline Structure of AACE’s TCM Framework (TCM Figure 1.3-1)

The *TCM Framework* is based on a series of integrated processes and risk management (Section 7.6) is fundamental to PRMP certification with certain relevancy to project risk management practitioners. A general understanding of asset planning and management (Sections 3.1 and 3.2 of Chapter 3), as they relate to risk management, is also important since there are several parallels between assets and projects. The words “asset” and “project” are oftentimes used interchangeably herein.

All processes in TCM are integrated, and risk management is linked to the chapters of the *TCM Framework* as shown in Figure 2.

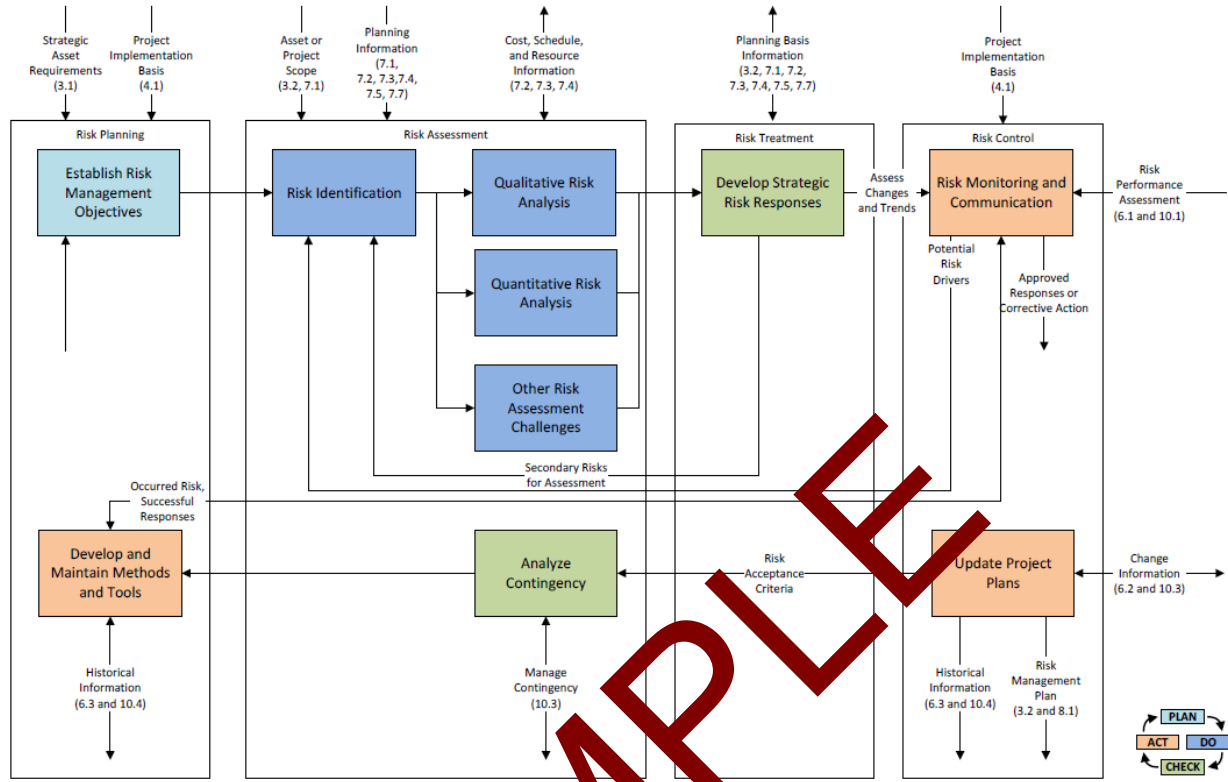


Figure 2 — The TCM Framework Process Map for Risk Management (Section 7.6)

Project risk management practitioners must have a thorough understanding of the skills and knowledge summarized above. These skills and knowledge are consistent with *RP 121R-21*.

This study guide and the PRMP examination generally follow the four-part outline shown in Figure 3:

1. Supporting Skills and Knowledge	2. Communication Competency	3. Overall Risk Management Terminology and Concepts	4. Risk Management Skills and Knowledge
1.1. Elements of Cost	2.1 Memorandum	3.1. Specific Risk Management Terminology and Concepts	4.1. Processes and General Practices in Risk Management
1.2. Elements of Cost Estimating		3.2. Statistics and Probability	4.2. Specific Risk Management Practices
1.3. Elements of Planning and Scheduling			
1.4. Other Functional Skills and Knowledge			

Figure 3 — Summary of PRMP Required Skills and Knowledge

The overall learning objectives of this study guide are:

- Understand the basis of project risk management within the *Total Cost Management Framework* as illustrated in Figure 2.
- Understand the processes and practices of project risk management.
- Describe what is essential to planning and implementing a project risk management process and apply its practices within a capital management or project organization in various settings. And,
- Understand the essentials of all supporting skills and knowledge necessary to plan and implement project risk management.

Following is a list of references that provide the general basis of knowledge outlined in this study guide. This list is not comprehensive and includes the primary material relevant to PRM. A comprehensive listing is included as Appendix F in the Appendices accompanying this study guide.

1. *AACE International Recommended Practice 10S-90, Cost Engineering Terminology*. [Note that this is a comprehensive listing of terms in the field of cost engineering, wherein definitions are located for the cited terminology in this study guide.]
2. *AACE International Recommended Practice 11R-88, Required Skills and Knowledge of Cost Engineering*.
3. *AACE International Recommended Practice 14R-00, Responsibility and Required Skills for a Planning and Scheduling Professional*.¹
4. *AACE International Recommended Practice 16R-11, Required Skills and Knowledge of Project Cost Estimating*.²
5. *AACE International Recommended Practice 17R-97 Cost Estimate Classification System* (Note: There are other Recommended Practices on this topic developed for specific industries. Please refer to those as applicable.)
6. *AACE International Recommended Practice 23R-02, Identification of Activities*.
7. *AACE International Recommended Practice 24R-03, Developing Activity Logic*.
8. *AACE International Recommended Practice 27R-03, Schedule Classification System*.
9. *AACE International Recommended Practice 40R-08, Contingency Estimating: General Principles*.
10. *AACE International Recommended Practice 41R-08, Risk Analysis and Contingency Determination Using Range Estimating*.
11. *AACE International Recommended Practice 42R-08, Risk Analysis and Contingency Determination Using Parametric Estimating*.
12. *AACE International Recommended Practice 43R-08, Risk Analysis and Contingency. Determination Using Parametric Estimating – Example Models as Applied for the Process Industries*.

¹ Risk management professionals need not be schedulers, but such skill knowledge is necessary in accordance with RP 121R-21

² Risk management professionals need not be estimators, but such skill knowledge is necessary in accordance with RP 121R-21

13. *AACE International Recommended Practice 44R-08, Risk Analysis and Contingency Determination Using Expected Value.*
14. *AACE International Recommended Practice 57R-09, Integrated Cost and Schedule Risk Analysis Using Risk Drivers and Monte Carlo Simulation of a CPM Model.*³
15. *AACE International Recommended Practice 58R-10, Escalation Principles and Methods Using Indices.*
16. *AACE International Recommended Practice 62R-11, Risk Assessment. Risk Identification and Qualitative Analysis.*
17. *AACE International Recommended Practice 63R-11, Risk Treatment.*
18. *AACE International Recommended Practice 64R-11, CPM Schedule Risk Modeling and Analysis: Special Considerations.*
19. *AACE International Recommended Practice 65R-11, Integrated Cost and Schedule Risk Analysis and Contingency Determination Using Expected Value.*⁴
20. *AACE International Recommended Practice 66R-11, Selecting Probability Distribution Functions for Use in Cost and Schedule Risk Simulation Models.*
21. *AACE International Recommended Practice 67R-11, Contract Risk Allocation.*
22. *AACE International Recommended Practice 68R-11, Escalation Estimating Using Indices and Monte Carlo Simulation.*
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29. Uppal, Kul B. (Ed.), *AACE Professional Practice Guide No. 8, Contingency, 4th edition,* (2015).
30. *AACE International Recommended Practice 77R-15, Quality Control/Quality Assurance for Risk Management.*
31. *AACE International Recommended Practice 104R-19, Communicating Expected Estimate Accuracy.*

This study guide assumes candidates have a basic knowledge of PRM; it addresses PRM skills, knowledge and competencies that are non-industry specific. This study guide further aims to help candidates learn basic terminology, processes, and practices for project risk management. A candidate's company or

³ Very limited application to the PRMP certification and a general understanding of this RP is sufficient. This practice can only be used with quantitative risk assessments when a high-quality cost-loaded schedule is available.

⁴ Same comment as footnote 3.

industry, however, may dictate or emphasize other PRM processes for capital asset, project, program, or portfolio management.

This study guide does not provide a hierarchy of importance among the various references, and it is the PRMP candidate's responsibility to make such judgments. *RP 121R-21* makes a distinction between "primary" (P) and "secondary" (S) PRM skills and knowledge. As stated in that RP, "A primary (P) skills and knowledge topic will be one that the PRM practitioner should be able to understand and perform at any of the levels in the list above. A secondary (S) skills and knowledge topic will be one where the expected understanding is only knowledge and comprehension." It is important to understand that both primary and secondary topics may be included as multiple-choice questions in the examination and that both are scored as one point each. These "P" and "S" designations are provided as a study aid when a specific topic is introduced within the study guide.

Furthermore, the candidate is responsible for using the latest versions and editions of all references, even those issued or revised after the date of this study guide. Candidates must also draw from the competencies acquired through personal experience in project risk management and cost engineering experience.

What is Project Risk Management and What is a Project Risk Management Professional?

RP 10S-90 defines a project as "A temporary endeavor with a specific objective to be met within the prescribed time and money limitations and has been assigned for definition or execution." It goes on to define a program as: (Definition of a set of projects with a common strategic goal. It is within those parameters that a Project Risk Management Professional will practice."

It must be noted that Total Cost Management is broader and encompasses other elements that are often inputs to and important to comprehensive risk management including decision analysis, strategic asset management, and certain business functions. Those elements are not expressly included herein but will become important during a PRMP's career development into more advanced levels of risk management. The AACE International Certification Institute is currently reviewing and revising its Decision and Risk Management Professional (DRMP) certification to include relevant elements as part of that expert-level certification program.

Research shows that the success or profitability of a project is largely determined by the quality of a decision or advancement from one phase of a project to the next and specifically the planning and analysis leading to those events. Key to proper planning and analysis is risk management. Failure to manage risks during execution can lead to loss of planned value. Failure to manage risks can further diminish success of the specific work or the profitability of the entire enterprise, depending on the scope and impact of the risk.

An individual holding PRMP certification is key to effective project execution (or within a program/portfolio when multiple projects are involved). That individual is a skilled and knowledgeable practitioner whose role is to establish an effective risk management plan and implement that plan in accordance with the project, program, and portfolio's objectives. It is the PRMP's responsibility to communicate clearly in oral and written forms, both internally and externally, as required.

As identified in the *Total Cost Management Framework*, Section 7.6 Risk Management is a systematic and iterative process comprising four steps:

1. **Plan:** establish risk management objectives
2. **Assess:** identify and analyze risk
3. **Treat:** plan and implement risk responses, and
4. **Control:** monitor, communicate, and enhance risk management effectiveness

The goal of risk management is to increase the probability that a planned asset, project, or portfolio achieves its objectives. In TCM, potential deviations from plans are all considered potentially adverse to overall performance. In this sense, perceived opportunities may also pose a threat. If properly managed, however, the project- or asset-management team may be able to capitalize on "opportune" uncertainties.

The risk management process is applied in conjunction with the other asset and project control planning processes, such as scope development, cost estimation, schedule planning, schedule development and implementation, resource planning, procurement planning, and financial systems integration. Within the context of TCM's strategic asset management process, enterprise risk management (ERM) recognizes that the risk management process should be applied to overall enterprise, portfolio, and program-level objectives, and not just to a single business unit, asset, or project.

The risk management process, from a project control standpoint, is designed to address uncertainty in both project inputs and outcomes. The process, however, generally applies and is critical to addressing uncertainty in the inputs to and outcomes of any decision.

An initial challenge that any project risk management professional must deal with is the fact that the definitions of uncertainty and risk differ among practitioners and industries. For the risk management process within the *TCM Framework*, risk is defined as "an uncertain event or condition that could affect a project objective or business goal." The effect may be either positive or negative, i.e., an opportunity or threat. This definition is consistent within the project management and finance fields, e.g., ISO, PMI, etc., which have achievement of a target as their goal. Other fields, however, such as safety and insurance, tend to equate risk and uncertainty with only negative effects or threats.

PRMP Certification Examination Structure

Introduction

To be certified as a PRMP, a candidate must meet the minimum eligibility requirements and successfully pass a written examination as determined by the AACE International Certification Board. This study guide provides helpful information and guidance needed to prepare for the PRMP examination. A professional specializing in project risk management is expected to keep abreast of these advances and demonstrate this knowledge in the examination.

Basis of the Examination

The purpose of any professional certification or licensing program is to provide a mechanism to formally and objectively evaluate and publicly recognize the capabilities of an individual in a defined skill area. Certification as a PRMP recognizes certificate holders who have demonstrated their professional competence in project risk management.

In summary, *RP 121R-21* and the PRM portion of *RP 11R-21* form the foundation of the PRMP certification examination, which addresses the following:

- Minimum knowledge covered by the basic skills documents; and
- Advanced knowledge based upon PRM experience.

Examination Structure

The PRMP exam contains multiple-choice questions and one written memo assignment for a total of 120 questions. The candidate must receive an overall score of 70% across **all of** the four sections shown in Figure 3 in order to pass the exam successfully, as determined by the Certification Board. Specifically, each section score is added together and divided by four to arrive at an overall score.

Format of the Examination

- **Multiple Choice Questions:** The exam is delivered through computer-based testing (CBT) and is comprised of multiple-choice and compound scenario questions. The topics covered in the exam closely align with *RP 121R-21*. The questions follow along with Sections 1, 3, and 4 as shown in Figure 2.
 - Several multiple-choice questions will be based on scenarios and require more than one answer to complete. A scenario question uses a split screen and provides the examinee with an adequate description of a specific scenario. The scenario will offer up to seven (7) different questions directly related to the scenario provided. Each question will include four (4) potential answers, with only one (1) correct answer.

- Note that some example questions within this study guide are not in a multiple-choice format, but instead may be True/False or require a brief explanation. These specific question types are intended to aid the overall study process and provide valuable information. There will be no such question formats on the exam.
- **Memo Assignment:** The memo assignment (Section 2 in Figure 3) will allow the candidate to choose from an onscreen list of suggested scenarios and will require the candidate to demonstrate professional written communication skills and a general knowledge of risk management competency. The memo will be written in the text box provided onscreen and should demonstrate a candidate's ability to organize thoughts and communicate effectively. The memo will need to be addressed properly, including a purpose statement, proposed solution with supporting details and including a closing statement. Chapter 2.0 provides more details on this requirement.

Although the exam is closed book, candidates are permitted to bring any style of calculator, including programmable calculators, to use during the exam.

The examination is not based upon the use or knowledge of a specific software, but rather, embodies the knowledge and experience of a PRM practitioner using such tools. All materials used by the candidate during the examination, including work paper, must be turned in upon completion of the examination.

Recognizing that there are many industries and fields within the profession— including engineering, construction, manufacturing, process facilities, mining, utilities, transportation, aerospace, environmental, and government—candidates can expect questions that are general enough to apply, or be specific, to any of these practice areas. The examination considers the fact that no one can be expected to be conversant in all practice areas through the multiple-option format and extensive use of questions of general applicability.

PRMP candidates are expected to have reasonably broad skills, knowledge, and experiences in cost engineering in addition to specific PRM skills and knowledge. While it is not required, candidates will benefit from first passing the Certified Cost Professional (CCP) examination because of the shared skills and knowledge of Total Cost Management and cost engineering in general. However, passing the PRMP is not a substitute for nor an indicator of achievement of the CCP. PRM professionals cannot provide effective support to project leaders without understanding the context of the relevant asset and project management process.

Finally, communication skills are vital to ensuring that the impacts of risks are identified and understood, particularly among stakeholders, decision makers, and managers who have strong expectations and biases. Before investing in the effort and expense required for taking the exam, candidates should objectively review their understanding, skill, and experience of this diverse body of knowledge.

CHAPTER 1.0 - SUPPORTING SKILLS AND KNOWLEDGE

RP 121R-21 and this study guide place a significant emphasis on these supporting skills and knowledge. PRM is an overlay onto, i.e., integrated with, the base cost and schedules of a project and these disciplines simply cannot stand alone. The next sections follow the overall format of *RP 121R-21* and Figure 2 as shown on page 2 of this study guide. If there is any inconsistency between this study guide and the recommended practice, the recommended practice shall take precedence. This is only a guideline to prepare for the examination and additional information relative to the material presented herein can be found in the recommended practices and other AACE resources.

Introduction

The practice of risk management takes place throughout the life cycle of project management and is tied to all the processes in Total Cost Management. The first steps in TCM, whether for an asset portfolio, a program of multiple projects, or for a single project, are to gather requirements for project performance from varied stakeholders and to establish objectives and measures that will indicate if the requirements have been achieved.

Profit, usually measured in some form of return on investment (ROI), is the most common high-level objective and is the basis for most decisions within for-profit enterprises. Profit is not generally an objective for public entities and success is measured by a completed project that is delivered within the defined specifications, on time, and at budget. Other requirements and objectives may address quality, health, safety, environment, security, reputation, or other performance attributes of a portfolio, program, or project. The PRM professional must therefore understand both asset and project lifecycle processes and the many attributes of success to be planned, analyzed, and measured.

The TCM processes take place in varied cultural, political, enterprise, organizational, and team settings. There are many stakeholders to be consulted, considered, and dealt with, both internal and external to the organization. These stakeholders often have competing, sometimes conflicting, needs and expectations; each bringing different biases to the analysis. PRM professionals should have a basic understanding in organizational, cultural, political, behavioral, and psychological bodies of knowledge.

PRM professionals may be working for an owner, contractor, or consulting organization.

For-profit owner enterprises tend to lean more on the asset management (entire life cycle from development through obsolescence) side of TCM, making portfolio, program, and project investment decisions. The quality of those decisions are often strong drivers of success.

Public-entity owners are more focused on successful delivery of a quality project on time and at-budget. They may later move to an asset management focus after the project or program is successfully delivered, but asset management in that form is not part of the role of a PRMP as defined herein.

Contractors tend to focus on the project control side of TCM. The owner’s profit derives from return on capital assets—the strategic motivator is the investment decision, e.g., capital cost, and the biggest risks may be market, regulatory requirements, product, and production related. Conversely, the contractor’s profit derives from return on human capital—the strategic motivators are the resourcing and bid decisions, and the biggest risks tend to be execution related.

PRMP candidates must understand each of these perspectives. This study guide attempts to broadly recognize that a PRMP may function within a for-profit enterprise, a public entity delivering a public-works project, or a contractor supporting either type of owner organizations. While the text within this study guide cannot completely address each perspective in all cases, reliance is placed on the candidate to understand which one, or more, of the perspectives he/she is supporting and interpret or translate the material within this guide as applicable to the role encountered. The key point to remember is that the fundamentals of risk management are essentially the same irrespective of the specific application.

The candidate should also understand behavioral and psychological aspects since that understanding aids while performing risk elicitation, recognizing effective risk treatment/response plans, and communicating with stakeholders. Such knowledge and insight are learned skills that primarily come with practice and are not addressed in detail.

In summary, the PRMP candidate should have a firm understanding of the following supporting skills and knowledge concepts, see Figure 4:

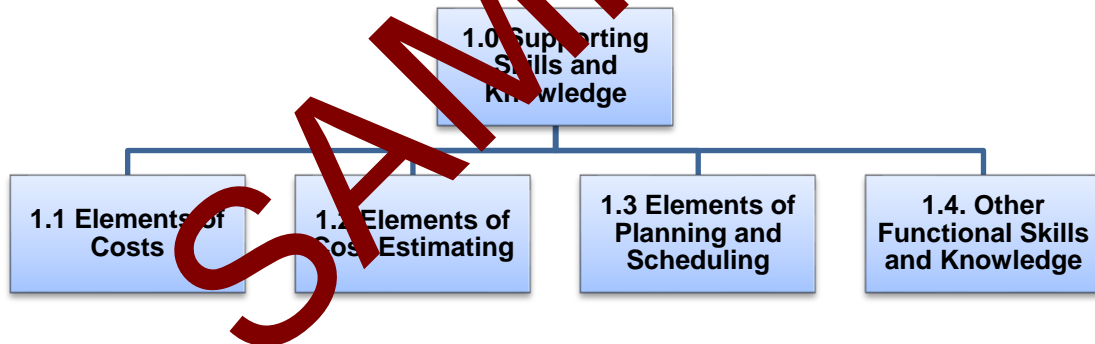


Figure 4—PRM Body of Knowledge Diagram for 1.0 Supporting Skills and Knowledge