



# **Project Manager's KnowledgeBase:**

PMP® Prep, Practice Exams &  
PMBOK® Case Studies  
Processes, Tools & Techniques

By Dick Billows, PMP, GCA

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# HOW TO USE THE PROJECT MANAGER'S KNOWLEDGEBASE

I've organized the material in the book so that you can adapt it to your individual learning style. The book will not only help you prepare for the Project Management Institute's PMI® certification examinations (PMP® and CAPM™) it is also a guide to applying the PMBOK®<sup>1</sup> to your projects. I'll refer to the PMBOK® throughout the book and rely on the full citation at the bottom of this page to avoid cumbersome duplication.

The KnowledgeBase allows you to study in ways that fit your learning style. You can:

- ☑ Read about concepts and use the flow charts to learn the details
- ☑ Use the 10 practice exams with the explanations of the answers
- ☑ Read real life examples and dialog between project managers and sponsors, stakeholders and the team as they apply the PMBOK® to different size projects. See their: scope statements, project charter, benefit/cost analyses, Monte Carlo simulation results and hundreds more examples.

The chapters in this book cover the nine knowledge areas in the PMBOK® and a 10th chapter on professionalism and ethics, which is on the exams but not in the PMBOK®. Each chapter is divided into four sections:

- ☑ Discussions of PMBOK® concepts with flow charts of all the PMBOK processes and their tools and techniques to help you learn the sequence of inputs, processes and outputs.
- ☑ Practice examinations with answers and explanations.
- ☑ Application of the PMBOK® concepts to three different size projects where you see project managers actually use the techniques and explain processes and results to the project sponsor.
- ☑ PMBOK® toolset pages that explain each tool with examples.

Use these components to tailor your exam prep to your individual learning style.

Best regards,

Dick Billows, PMP, GCA

P.S. As always my thanks to my project consultants and nit-picking editorial staff: Sally Mitsch, Leslie Schiefelbein CAPM, Elizabeth Graves CAPM and Juana Cortez. Their work in finding flaws, from conceptual to grammatical was superb. Any remaining errors come from problems I intentionally hid from them.

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<sup>1</sup> *A Guide to the Project Management Body of Knowledge: PMBOK Guide 2000 Edition*, The Project Management Institute, Inc., 4 Campus Boulevard, Newton Square, PA 197003

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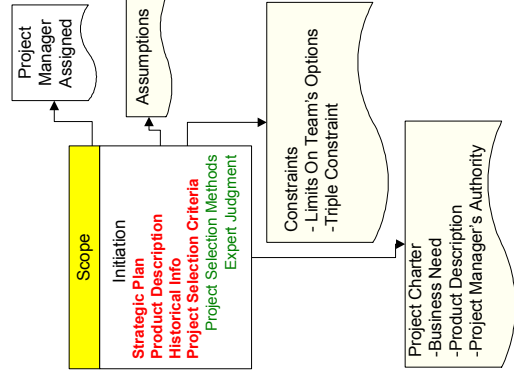
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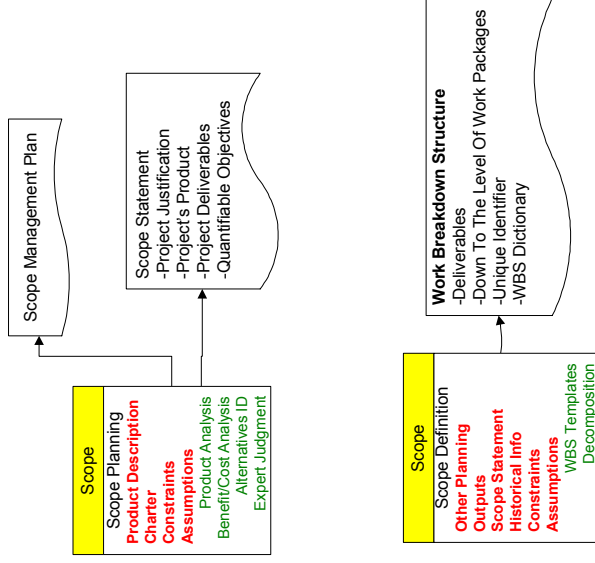
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# Scope Management

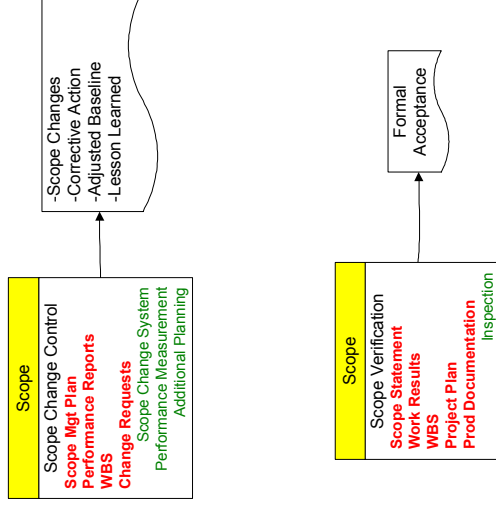
## Initiation



## Project Planning



## Controlling



# SCOPE MANAGEMENT

Scope management is a central concern for project managers because in the five processes that comprise scope, we identify, elaborate and then control what is, and what is not, included in the project. The PMBOK® assumes that we start with a product description, project selection criteria and insights into organizational strategy, all supplied by management. This may not reflect how things happen in your organization but it is how PMI® says things should work.

From these inputs, we produce a number of major outputs within the first three scope processes; these outputs are the charter, which is issued by senior management and the scope statement. At this point, our processes in procurement and quality can begin. As well, the next scope process, scope definition, can now start and we can produce the WBS. Then our work on risk, time and cost can commence.

With the planning underway in all the other processes, our scope management work stops until we reach the controlling process group. There, scope verification and scope control commence. In scope verification, we confirm that what we have been developing is what we described in the original scope statement. During scope control, we manage any changes to the scope, using the change control processes documented in the scope planning.

## **SCOPE INITIATION**

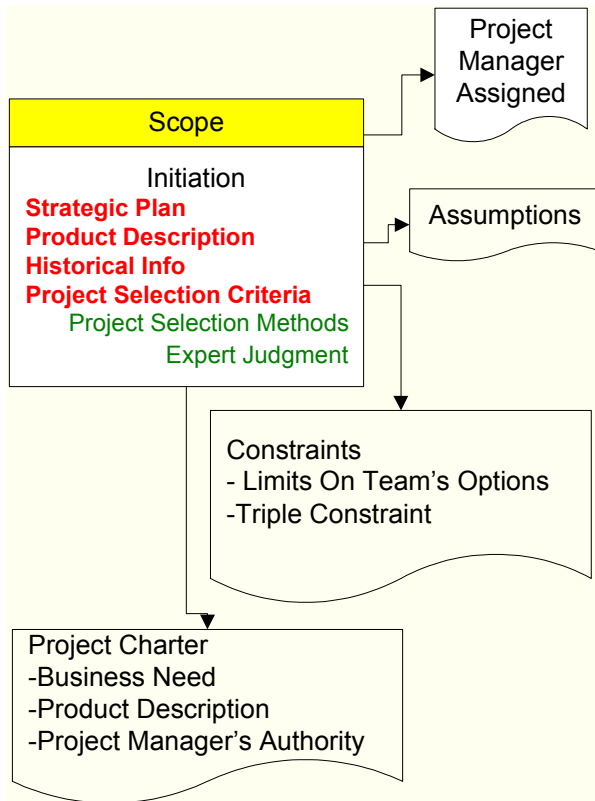
During scope initiation, senior management formally authorizes the project by issuing the project charter. Prior to that authorization, the project has passed through the organization's project selection criteria approval process and has been approved to use organizational resources. The project manager is appointed and given authority to manage those resources in the charter. We will also produce the project constraints and assumptions in this process. They'll form the boundaries within which all the other planning processes operate.

## **INPUTS TO SCOPE INITIATION**

There are some very significant inputs to scope initiation. The first and most important input is the product description. It describes the characteristics of the output or deliverable the project is to create and it spells out the relationship between this product of the project and the business need it fulfills.

Questions on the PMI® certification exams about the product description are difficult for many project managers because their work on a project usually does not start with such a succinct description of what is to be achieved and the reasons for achieving it. But you must put yourself in the PMBOK® world to correctly answer the exam questions. The product description is the first of many situations where your experience may differ from the ideal world of the PMBOK®. However, the exams are based on how organizations and project managers should manage projects. To pass the exam you will have to adopt the PMBOK® mindset.

The strategic plan and the project selection criteria are also inputs to scope initiation. The strategic plan is used to align the project with the organization's business goals. The project selection criteria come from the organization and are standards that new projects must meet in order to be approved.



The last input in scope initiation is historical data. Throughout initiation and many other PMBOK® processes, we use records of previous projects. Building an archive of project data, including the work results, actual versus planned work, duration and project performance, makes the planning of subsequent projects much easier and, as importantly, more accurate.

## TOOLS & TECHNIQUES OF INITIATION

Project selection methods utilize the criteria which the organization has established for approving new projects. The point of that process is to ensure that organizational resources are used effectively and that all approved projects yield an appropriate amount of value or benefit in relation to their cost. The evaluation criteria are the financial and operational standards that a project must meet to be approved.

The evaluation methods range from straightforward to complex. We may simply compare the benefits to the costs. Calculating the payback period gives a measure of time that a project takes to repay its cost. So a project that costs \$35,000 and generates \$10,000 of benefit a year would have a 3.5 year payback period. Another measure for evaluation is the benefit/cost ratio. Using that same example, if the project above has a 5 year life, it would have a benefit/cost ratio of 1.42 (50,000/35,000). Projects with a benefit/cost ratio of less than 1.0 return less value than their cost.

More complex evaluation methods may include mathematical models, often called constrained optimization, with analysis of a project using linear or dynamic programming models. Alternatively, we may use expert opinions to evaluate the worthiness of new projects in combination with mathematical techniques.

## OUTPUTS FROM SCOPE INITIATION

The outputs from scope initiation are the constraints and assumptions, the identification and the assignment of the project manager and the project charter. During the scope initiation process, we want to assemble information from as many people as possible. We will talk to the stakeholders, sponsor, senior management and possibly experts and involve all of them in elaborating the product description. The constraints may come from an executive who puts a limit on the cost of the project or the resources that can be used for the project. We also develop the assumptions, which are aspects of the project that we consider to be correct or accurate, and we will test these later in risk management.

The output of these discussions with the stakeholders is the charter, which is the document that formally authorizes the project. The charter is issued by a manager external to the project who has sufficient authority to authorize the project manager to utilize the resources the project requires. In the PMBOK® the sponsor role does not include issuing the charter, although in the real world the same individual may play both roles. The charter gives the PM the authority to manage resources needed to produce the product of the project. It also provides people with information about:

### FIGURE 1 CHARTER COMPONENTS

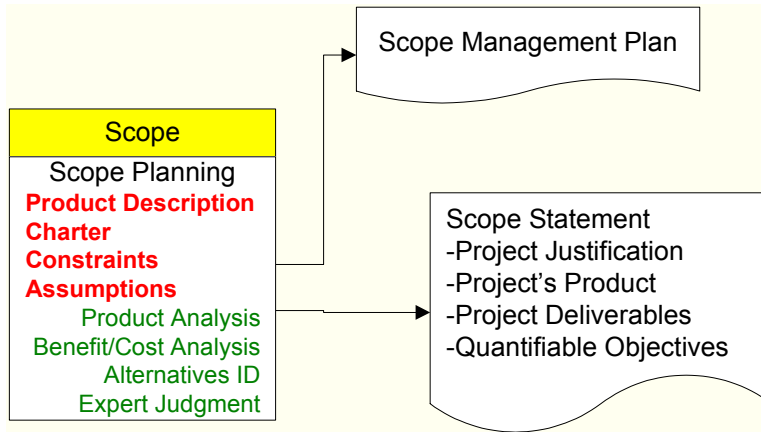
- ☑ The product that the project will produce
- ☑ The business need the project's product will meet
- ☑ The objectives
- ☑ The justification for doing the project, such as:
  - Market demand
  - Business need
  - Customer request
  - Technology advance
  - Legal requirement
  - Social need

The last big issue in scope initiation is the identification of the project manager. Ideally, during the scope initiation process, the project manager is appointed, although the PMBOK® says that the appointment of the PM can be delayed but must occur by the beginning of execution.

## SCOPE PLANNING

The second process in the scope management knowledge area is scope planning. During scope planning, we expand our understanding of the deliverables needed to produce the product of the project. We break the product of the project down into its component deliverables and in the process, consider alternative ways to reach the end result. The scope statement we produce is the driver behind the planning for time, cost, quality and procurement. Those processes must wait for the scope statement as an input before they can begin. It is also the document we will later use to confirm that the project has produced the desired end results for the project's customer. A key point in the scope planning is the

involvement of as wide a community of stakeholders as possible. This can include sponsors, senior management, functional managers, customers, employees, vendors and regulators.



## INPUTS TO SCOPE PLANNING

The inputs to scope planning are the product description, the project charter, assumptions and constraints, which should be familiar as we developed them in the preceding process. The product description, which is expanding as we move through this scope process, gives us the target at which the project is aimed. The constraints are the restrictions imposed by management or the outside world on the project budget, duration or resources. Last, we consider the assumptions in which we describe a wide variety of potential impacts on the project. We'll treat them as true throughout planning and test them in risk analysis.

## TOOLS AND TECHNIQUES OF SCOPE PLANNING

We use a broad range of tools to develop the scope statement. We use product analysis in many different forms to break down the product of the project into its component deliverables. We then use identification of alternatives as a way of considering options for delivering those components. Next, we compare the alternatives with tools ranging from benefit/cost analysis to return on investment, or payback period. Expert judgment comes from the stakeholders, the sponsor, organizational managers and experts from outside the organization.

## OUTPUTS FROM SCOPE PLANNING

We produce the scope statement and the scope management plan from this process. We'll base all future planning on the scope statement. The scope management plan can be either formal or informal but it details the processes and procedures we will follow to make changes to scope, including the identification of the decision-makers who must approve these changes.

FIGURE 2 SCOPE STATEMENT ELEMENTS

The scope statement should include:

**Project Justification:** the business need the project is to address

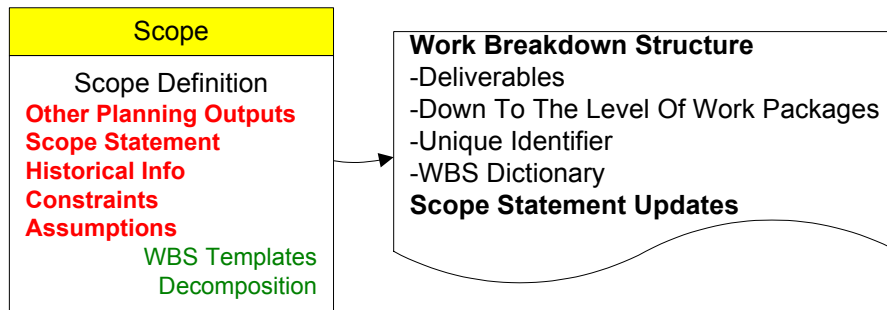
**Project's Product:** a description of the product of the project

**Project Deliverables:** a description of the deliverables that must be completed in order to sign off on the project completion

**Project Objectives:** include quality measures, cost and schedule milestones that must be met for a successful project

## **SCOPE DEFINITION**

During the scope definition process, we further break down the project deliverables into the work breakdown structure (WBS). The goal of this process is to increase the accuracy of our estimates for duration and cost. The WBS gives us the framework for all our further planning, control and performance measurements and the project team should play an active role in its development. The team members' involvement not only improves the information but enhances their ownership of the plan.



## **INPUTS FOR SCOPE DEFINITION**

We use the scope statement, constraints and assumptions, as well as inputs from the other planning processes that are underway in procurement, communications and quality. Information about previous projects and their work breakdown structures is also used and can be a significant time saver.

## **TOOLS AND TECHNIQUES OF SCOPE DEFINITION**

We develop the WBS by either borrowing information by using work breakdown structure templates from previous projects or by decomposition. Often the final WBS will have a combination of decomposed and template sections. The work breakdown structure templates are essentially the work breakdown structures, or sections of them, used in previous projects. They may also take the form of standard lifecycle steps used in a specific technology, like the standard sequence of steps to build a structure or develop software. These templates are useful because they reduce the amount of time or work spent on developing a new work breakdown structure.

Decomposition is the process of subdividing the major deliverables of a project into their components. This is usually performed by small groups who will be doing the work and is often done by thinking through the sequence of components they will deliver.

Regardless of the techniques used, we only detail the WBS down to the point where we can make adequate estimates of cost and duration.

### OUTPUTS OF SCOPE DEFINITION

The first output of scope definition is the work breakdown structure (WBS). It is created with the active involvement of the team and is a hierarchical pyramid of the project. The highest level in a WBS is the product of the project which is then sub-divided into 4-8 major deliverables to make up the second level. These major deliverables may be further sub-divided into their major components. The subdivision, or decomposition, continues until the deliverables are of a size suitable for scheduling and estimating, usually 2-10 days of work.

The WBS is used to communicate the project deliverables, define the scope of the project and give additional information for cost and duration estimating. Many other processes are structured around the WBS, like risk identification and quality management. The PMBOK® recommends that each item in the WBS be given an individual identifier, called a code of accounts. We can also develop a WBS dictionary and work package information which consists of the details, staffing information and requirements for each WBS entry.

The other scope definition output is the scope statement update. These updates are used to document any changes to the scope statement and we would follow the scope change control process to change it. This information should be distributed to the appropriate stakeholders.

With the development of the WBS and scope statement update document, we have completed our scope efforts in the planning process group.

### SCOPE VERIFICATION

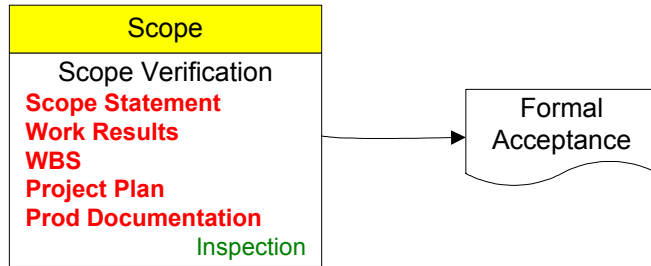
Once we have begun to execute and control the project, we resume our scope management processes. Scope verification is the process of formal acceptance of each major deliverable from the project, as described in the scope statement, as well as the final product of the project. This process is generally performed simultaneously with quality control to confirm both acceptance and correctness of the product. In the case where the project is not completed, the scope verification process should be used in order to document the extent of the completion of the project.

### INPUTS TO SCOPE VERIFICATION

We use several other inputs in addition to the scope statement, which is our principal verification baseline. We also use the work results which document the progress we are making on the deliverables. We will review product documentation (requirements, specifications, drawings, etc.) as well as the WBS.

### TOOLS AND TECHNIQUES OF SCOPE VERIFICATION

Inspection is the key technique in verification. The client, customer or sponsor must examine and inspect the products of the project and sign a document attesting to the fact that the product meets the specifications in the scope statement. The PMBOK® notes that these inspections may also be called reviews, audits or product reviews.

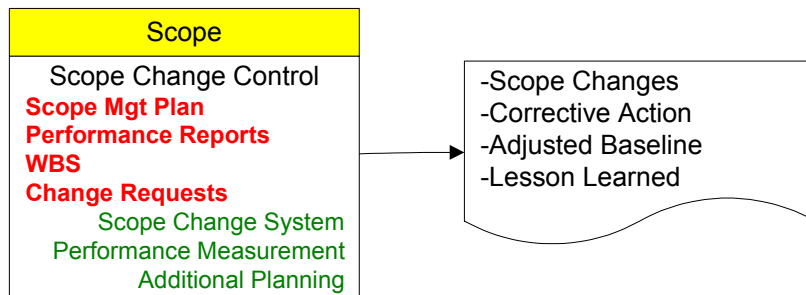


## OUTPUTS OF SCOPE VERIFICATION

Scope verification has only one output, which is the formal acceptance document. The formal acceptance document includes the sponsor's signature and language indicating acceptance of the project's deliverables and product. This acceptance can occur several times, once for each major deliverable.

## SCOPE CHANGE CONTROL

We invest a great deal of time in scope initiation, planning and development, building a solid foundation that lets us determine what should or should not be included in the project. During scope change control, we use this foundation to monitor the factors that create change, determine whether changes have occurred and keep abreast of changes that do occur.



## INPUTS TO SCOPE CHANGE CONTROL

We use the WBS as our detailed map of what should happen in the project. Our performance reports tell us what is happening as do the change requests that may be submitted by the team or a stakeholder. The key issue in change control for the project manager is careful assessment of any change request.

## TOOLS AND TECHNIQUES OF SCOPE CHANGE CONTROL

We use our scope change control system and performance measurement as the principal tools in this process. The scope change control system defines the process that must be used in order to make changes to the project scope. It should outline the paperwork and level of authority required to authorize changes to scope. Performance measurements assist in evaluating any variations that do occur and in deciding what sort of corrective action, if any, is necessary. Corrective action is the alternative to changing the scope and so it is the project manager's first option.

### OUTPUTS OF SCOPE CHANGE CONTROL

Scope changes, corrective action, lessons learned and the adjustment of the baseline are the outputs we produce in scope change control. Scope changes are considered if corrective action that would bring future performance in line with the scope baseline is not possible. The project manager conducts a thorough analysis of the proposed scope change to assess its affect on all four of the triple constraints of time, cost, quality and scope (This is not a typo. This PMI® concept has evolved but the name has not changed). Adjustments to the scope baseline are made if the authorized decision-maker approves the change.

The documentation we create for our lessons learned includes a record of all scope changes and their causes. They are recorded for future PMs to use as a reference for their projects. Lastly, we adjust the baseline to reflect the changes to scope made during scope change control.

## ***APPLYING THE PMBOK® SCOPE MANAGEMENT CONCEPTS:***

To make the preceding concepts easier to understand, we'll apply them to:

- Small company or in-department projects
- Cross-functional projects
- Consulting projects for clients

In the previous sections, we covered the scope concepts and definitions you need to know for the PMI® certification examinations. In this section, you'll see how we apply those concepts, tools and techniques to realistic projects of three different scales. You'll see the techniques applied to real data and people which will help you understand the material for the examinations and follow the PMBOK® guidelines on your projects.

The three projects we will look at all address the same business problem/opportunity which is the improvement in the effectiveness of their handling of customer trouble reports. The business need comes from the customers the company is losing as a result of poor handling of customer problems.

Each project also has the same product description and major deliverables. They differ only in the scale of the effort. As a result, the project managers apply different PMBOK® tools and techniques as they move through the PMBOK® processes. The point of this section is to show you how to apply the best practices and select the appropriate techniques for a particular project. The three projects are:

- Project #1: In-department project – this project takes place within a functional department. All six of the project team members and project manager report to the same boss, who fills the roles of project sponsor and functional manager as well as senior management. The stakeholders are:
  - All 15 employees in the department.
  - The human resources department, which may be involved in some of the staffing and training.
  - The sales department, which has committed to a higher level of service with a major customer.

The department is organized along functional lines and the project manager has just secured a PMP® certification.